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PROF. W. P. BLAKE has returned to New Haven after an extended tour through the Western mining regions.

THE Western steel-mills have not yet come to an arrangement with their employés in regard to the reduction of wages.

"SEMI-OFFICIALLY," the announcement is made that the Tariff Commission will recommend but slight changes in our present tariff. It seems that it is eager to obtain credit for its heroic resistance to the demands of the potters and the iron and steel workers. Those who have so earnestly pleaded to be "let alone" will be pleased.

THE rapid growth of the production of lead in this country holds out the possibility that we may be forced to follow the development of lead mining abroad with greater interest than we have been doing in the past. Spain, with an annual output of 120,000 tons, stands next to us as a producer, and some data concerning its most important district, that of Linares, will therefore be of interest. This district, which is located in the province of Jaen, 190 miles by rail from Madrid, produced in 1881 67,050 tons of lead, or its equivalent of high-grade ore. It is estimated that English capital is interested in the mines to the extent of $2,700,000, and notwithstanding the fact that the price of lead has been so low during the past year, those of the English companies of which we possess returns have made a small profit. The Fortuna, with a capital of £50,000, yielded a profit, during the last half-year, of £1155 ; the Linares, with a capital of £45,000, has, during the same time, yielded only £730 ; and the Alamillos has earned in six months £4388 on a capital of £70,000. The aggregate dividends of the first have been four times the capital invested ; and those of the second over six times. All of them are now quoted above par. It will be seen, therefore, that the well-managed Spanish lead mines are able to work without loss, even under such circumstances as the present low price of the metal ; and this is particularly striking when it is remembered that the base bullion of the Linares District does not average more than eleven ounces of silver.

SOME time since, we printed statistics relating to the cost of wire ropes in our anthracite collieries. We have before us some statistics of the wear of ropes in the collieries in two important German districts, the results of which are of interest compared with our own. Our German authority adopts as a unit the number of metric tons raised per rope ; that is, the number of tons of coal hoisted one meter high. In order to render the figures more manageable, the unit has been taken as 1000 metric tons. The following table gives the efficiency of ropes in the two districts in four years, and their average life :

YEAR.	DORTMUND DISTRICT.		SAARBRUECKEN DISTRICT.	
	Efficiency in 1000 metric tons.	Life in days.	Efficiency in 1000 metric tons.	Life in days.
1877	23,787	535	10,888	444
1878	26,956	554	12,099	429
1879	28,971	539	14,363	538
1880	36,879	577	14,034	535

In the Dortmund District, the speed of hoisting and the depth from which the coal is drawn are both much greater. Taking the highest and the lowest figure in the above table, they are equivalent to 111,669,402 and 32,968,864 foot-tons. Computing the average of the six ropes also used in shafts in the test of our anthracite colliery ropes, given in our issue of the 8th of February, by Dr. CHANCE, we have 66,897,312 foot-tons, or about the average.

THE PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES IN 1881.

Mr. HORATIO C. BURCHARD, Director of the Mint, has just issued his usual annual report upon the production of the precious metals in the United States for the calendar year 1881. It does not in its character or its scope differ much from similar compilations of former years. So far as the body of the work is concerned, which aims at presenting a review of progress in the Western States and territories, we would only repeat the remarks which we have made in past years. With the exception of the meritorious report on Montana, from the pen of Mr. R. B. HARRISON, of the United States Assay-Office at Helena, some notes on certain sections in Idaho by Mr. C. C. CLAWSON, of Bonanza, a sketch of mining in some Colorado districts by Mr. FRANK HALL and Mr. H. SILVER of Denver, one by Mr. O. J. HOLLISTER, of Salt Lake City, on Utah, and a special review by one of the employés of the office, Mr. F. P. GROSS, on New Mexico, the mining review is an aggregate of mining notes gathered from the mining press. We can not trace in it a very critical spirit, nor is the matter treated in so broad a manner as to give it a special value.

The third part contains a report on minining machinery by Mr. CHARLES G. YALE, which is a collection of no special merit ; a rather remarkable contemplative paper on quartz-crushing machinery by Mr. JOHN RICHARDS ; papers by Mr. MELVILLE ATWOOD and Mr. C. H. AARON ; and a very good summary of the literature on the auriferous gravels of California by Mr. JOHN HAYS HAMMOND, M.E., of San Francisco.

The most important part of the work is summarized in the few pages of the letter of transmittal, in which Mr. BURCHARD gives his estimate of the production of the precious metals during the year 1881, in the collection of the data for which Mr. A. M. LAWVER and Mr. H. L. DODGE, both of the San Francisco Mint, seem to have done effective work. Aside from direct returns from the mines, which are always incomplete, the chief reliance in making the estimates of the yield have been the receipts at the mints, checked by Mr. VALENTINE'S estimates, based upon the business of the express companies and other conveyances. To the figures obtained by the returns of bullion deposited at the mints, Mr. BURCHARD adds the undeposited domestic bullion exported—a comparatively small amount—and the figures of the quantities used in the arts, as indicated by the returns of manufacturers. From these data, Mr. BURCHARD has compiled the following estimates :

PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES IN 1881.

	Gold.	Silver.	Total.
Alaska	$15,000	.....	$15,000
Arizona	1,060,000	$7,300,000	8,360,000
California	18,200,000	750,000	18,950,000
Colorado	3,300,000	17,169,300	20,460,000
Dakota	4,000,000	70,000	4,070,000
Georgia	125,000	.....	125,000
Idaho	1,700,000	1,300,000	3,000,000
Maine	.....	5,000	5,000
Montana	2,330,000	2,630,000	4,960,000
Nevada	2,250,000	7,060,000	9,310,000
New Mexico	185,000	275,000	460,000
North Carolina	115,000	.....	115,000
Oregon	1,100,000	50,000	1,150,000
South Carolina	35,000	.....	35,000
Tennessee	5,000	.....	5,000
Utah	145,000	6,400,000	6,545,000
Virginia	10,000	.....	10,000
Washington	120,000	.....	120,000
Wyoming	5,000	.....	5,000
Total	$34,700,000	$43,000,000	$77,700,000

These figures show a gain of over $4,000,000 in the production of silver and a loss of about $1,250,000 in the yield of gold, as compared with Mr. BURCHARD'S estimate for the preceding year.

THE MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The second annual meeting of the American Society of Mechanical Engineers was held in this city on the 2d and 3d inst. The society is beginning to develop those signs of vigorous growth which its founders had good reason to believe it capable of. Unlike its predecessors in other branches in this country, the Society of Civil Engineers and the Institute of Mining Engineers, it made a start on quite a pretentious scale, and in its early days was beset by dangers which have not, it is true, been quite removed, but which are now in a fair way to yield to a better understanding of the measures by which the aims of the society are to be attained. From the very character of the subjects which come within the special domain of the society, the settlement of the question how they are to be presented and discussed is a peculiarly difficult one. This was strikingly shown during the course of the present meeting, in one instance at least, when a paper largely mathematical was brought up. An intelligent discussion of contributions of such a character can only be successful when those members qualified to take up the subject have had an opportunity to examine them beforehand. In other societies, such papers are either placed, in printed form, in the hands of the members some time before the meeting, or the discussion is postponed to subsequent meetings. The Society of Mechanical Engineers has now decided, by an amendment to its by-laws, to adopt the former plan, and at the same time has wisely resolved to pursue a liberal policy toward the technical press. Although its expenditure in publishing its proceedings, which even now form two large volumes, has been lavish, the society is rapidly getting into a good position financially, and a slight retrenchment this year will enable it not only to continue the effective work of the past, but to increase its sphere of utility as its labors are more widely known and more generally appreciated. The society has now 350 members, and counts in its ranks not only the most eminent mechanical engineers in this country, but also a large number of the younger element of the profession. It may now be fairly said that the doubts of its ultimate success which may have been entertained by many are fast disappearing, and a future full of splendid possibilities lies before it. We are pleased to see in its ranks many mining engineers who have for years been active workers in the older society, which they have done so much to bring to its present high state of efficiency and usefulness. We hope to see the number largely increase. It is impossible to draw the line where the field of the one begins and that of the other ends. There are so many points of contact, so many common interests, that a frequent intercourse and a free interchange of opinion between mechanical engineers and mining engineers and metallurgists must prove of incalculable benefit, not only to both individually, but also to the great industries which they jointly represent.

On Wednesday, the members of the society attended the joint meeting of the three societies held in commemoration of ALEXANDER L. HOLLEY, upon whose "Life and Works" Dr. R. W. RAYMOND delivered a discourse. The first session of the society was held on Thursday. After the dispatch of formal business, and matters of important bearing upon the future welfare of the society, the president, Prof. ROBERT H. THURSTON, of the Stevens Institute of Technology, called upon Mr. WILLIAM K. SEAMAN, who read an admirable paper, fully illustrated, on the New Steel Rail Cambering Arrangement of the Lackawanna Coal and Iron Company. The first half of the plant is similar to the well-known Gusten straightening machinery. It consists of a series of guide-rollers on a hinged frame, so that the rail may be received from either pass of the mill. The hot rail, as it comes from the rolls, is carried along, sliding on the web, through a series of four grip-rolls to the hot saws, which take off the two ends, simultaneously cutting the rail. It then passes through a hot straightening machine to a cambering machine, by which it is given the slight curve which a hot rail should have in order to be straight when cold. From the cambering machine it is carried to the hot beds. One of the principal features of the plant is, that two cambering machines and two hot beds are provided, so that the steel-rail train is not stopped by any cessation of work at one hot bed. In order to be able to pass the rails to the first hot bed laterally, one of the grip-rolls and four sets of guide-rolls are so constructed that they can be lowered below the level of the buggy carrying the rail.

We can not enter into a description of the many ingenious details which have been elaborated to carry out this plan, nor dwell upon the points of excellence in the general design; suffice it to say, that in the grip-rolls one of the vertical rolls, driven by reversible miter-gearing from the line-shaft below the machines, is fixed. The second is loose and is adjustable, being on an eccentric shaft. In the guide-rolls, one is made adjustable in a similar manner; and in the rail cambering machines, consisting of two pairs of grip-rolls with a bending-roll, two are loose and one adjustable, and two are driven. The cambering machines are made rigid by an upper plate in which are the bearings of the rolls. The hot saw has no features worthy of special mention. The straightening machine, however, consists of five rolls, none of which is driven. Both the upper two and lower three rolls can by levers be raised or lowered a like amount. The mechanical details are very carefully worked out throughout, and particular precautions have been taken for ready access without exposure of bearings and gearing to scale. In the discussion, Mr. R. W. HUNT, of the Troy Steel-Works, spoke emphatically on the drawbacks of cold straightening, which should be avoided as much as possible, its evil effects being generally acknowledged to be great. Mr. SEAMAN does not profess to have overcome the necessity of subsequent cold straightening with the gag, because unavoidable differences in the temperature at which rails are rolled make it impossible to adjust the camber so nicely as to insure that all rails are straight. Mr. W. F. DURFEE was unable to see the necessity for such elaborate machinery when the older, simpler appliances were, in his opinion, capable of doing the full work without an excessive expenditure for labor. We understand that the new plant is to be adopted at an early date in the mill of the Lackawanna Coal and Iron Company, at Scranton, Pa.

After Mr. H. S. HAYWARD had described a simple Cut-Off Valve-Gear adopted by him in ferry-boat beam-engines, it was announced that a number of new members had been elected, and the following gentlemen were announced as the officers for the coming year: Mr. E. D. LEAVITT, Jr., President; Messrs. JOHN FRITZ, HENRY MORTON, and WILLIAM METCALF, Vice-Presidents; Messrs. ROBERT W. HUNT, CHARLES T. PORTER, and C. J. H. WOODBURY, Managers; Mr. CHARLES W. COPELAND, Treasurer. Mr. THOMAS WHITESIDE RAE is Secretary. Mr. FRANCIS B. ALLEN, of the Hartford Steam Boiler Inspection and Insurance Company, read a paper on the Protective Value of Boiler Inspection, in which he gave a historical sketch, noted the achievements of private inspection companies abroad and in this country, and made an earnest appeal to the profession to extend to the good work their aid.

The afternoon session was opened by the annual address of the retiring president, Prof. ROBERT H. THURSTON, who gave an admirable review of what had been accomplished in the different branches of mechanical engineering during the past year, and pointed out in what direction progress should be sought. Though, of course, only a rapid and general survey of the wide field, Professor THURSTON'S address touched the salient points in a very suggestive manner. It would be idle to attempt to summarize such a rapid review. Mr. THURSTON closed his address with a long statement of his views, or rather, his hopes on the labor question.

Professor S. W. ROBINSON, of the Ohio State University at Columbus, followed with a paper on the Back Pressure on Valves, and a supplement to an earlier paper on Pumping Engines; the last paper of the session being read by the secretary for Mr. C. C. HILL, of Chicago, on Difficulties in Road Locomotion, their Cause and Cure. The evening was devoted to the regular subscription-dinner.

The morning and afternoon of the second day were chiefly occupied in visiting points of interest in and about the city, including the Hudson River Tunnel, the Standard Oil Company's Works, at Bayonne, N. J., the East River Bridge, the Morgan Iron-Works and the station of the New York Steam-Heating and Power Company. As we go to press, the society is holding its final session for the presentation and discussion of papers and the reception of reports from special committees.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes.]

Bessemerizing Copper Ores and Mattes.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In his interesting article on Bessemerizing copper ores and mattes, in your issue of October 7th, your correspondent, J. D., Jr., seems rather to underestimate the advantages which the pneumatic process offers on our Eastern coast.

In the first place, he says: "As practiced, the production of metal by the pneumatic process fit for the refinery from a low-grade matte requires two cupola fusions and two Bessemerizings. Almost the same result could be obtained by two fusions and a careful calcination, which should cost less than two blows."

Lest this effusion cause diffusion of confusion about fusions, I would point out that there are fusions and fusions. In the ordinary way, you would have to use two *reverberatory* fusions and one calcination to accomplish what, in the pneumatic process, M. Manhès now does with two *cupola* fusions and two blows. Now, as a reverberatory fusion at Bergen Point or at Baltimore must cost more than twice as much as cupola fusion, in order to make the ordinary method appear the cheaper of the two, we must assume that a reverberatory fusion and a calcination are cheaper than two blows, which is by no means certain.

Again, he states: "While on this coast there is no low-grade matte to be had; or rather, not in quantities sufficient to keep a Bessemer plant busy." Here I believe that he is in error. At Bergen Point, we handle enormous quantities of low-grade copper matte: it is an article which can be bought and sold in great quantities in New York. As the manufacture of sulphuric acid increases with an ever-increasing rapidity, it is highly probable that the amount of matte produced by smelting the burnt pyrites (or cinders) will increase *pari passu*. Already there is a great deal of money spent in "bringing forward" these mattes. The present methods are costly and tedious. There is a great need of a more

rapid and cheaper process; and it has yet to be shown whether the pneumatic method may not at least temporarily satisfy this need.

PELTON, ARIZ., Oct. 18. HENRY M. HOWE.

Accidents in Metalliferous Mines and Collieries.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I have read with interest your article upon accidents in mines (Vol. XXXIV., No. 7); but I desire to call your attention to two points which seem to have escaped your notice in examining the statistics concerning mining fatalities.

In the first place, a simple comparison of the death-rates per 1000 persons employed at two classes of mines, such as coal and metal mines, rarely affords a correct estimate of their relative dangers. I pointed out the reason of this in my official report for 1878, in which I said: "In comparing these figures (that is, the death-rate per 1000 persons employed at mines in Cornwall and Devon) with similar data obtained from coal mines, we must not forget the large proportion of surface workers in the metalliferous districts; and in order to obtain a fair idea of the relative amount of danger to which coal and iron miners are respectively exposed, this source of error should be eliminated." I proceeded to show that the average death-rate per 1000 persons employed *underground* during the five years, 1874 to 1778, had been:

In mines in the United Kingdom under the Coal Mines Act	2·61
" " " " " " " " Metalliferous Mines Act	2·49
" " in Cornwall, Devon, Dorset, and part of Somerset, under the Metalliferous Mines Act	2·62

My remarks concerning these figures were as follows: "The result of this inquiry is somewhat startling and unexpected; for these figures show that, in spite of immunity from explosions of fire-damp, the occupation of a metal miner is almost as dangerous as that of a collier; indeed, as far as my district is concerned, it appears to be a shade more dangerous."

Averages extending over a longer period will be found in the last official Blue Book containing the reports of H. M. Inspectors of Mines for the year 1881. The exact figures are:

	Death-rate from accidents per 1000 persons employed.	
	Underground only.	Above ground and underground.
Mines in the whole of the United Kingdom under the Coal Mines Act	2·57	2·24
Mines in the whole of the United Kingdom under the Metalliferous Mines Act	2·39	1·63
Mines in Cornwall, Devon, Dorset, and part of Somerset, under the Metalliferous Mines Act	2·63	1·59
Slate mines in North Wales	3·28	2·07

The figures in the first column show that the tin and copper miners of Cornwall and Devon and the slate miners of North Wales have a more dangerous occupation than that of the miners employed in the coal, ironstone, fire-clay and shale mines of the United Kingdom; whereas, exactly the reverse appears to be the case, if we include the surface hands, because the proportion of these latter, with a much lower death-rate, is very much larger at the metal and slate mines than at coal and ironstone mines.

Your general conclusion that, on the whole, in Great Britain "the danger to life is less in metalliferous mines than in coal mines," is correct; but the difference in the amount of danger is much less than is generally supposed.

The second point relates to the comparative safety of ladders, man-engines, and cages.

You quote the valuable Prussian statistics giving death-rates of 0·101 and 0·115 per 1000 respectively for ladders and cages, and you draw the inference that the cage is less safe than the ladder. In my opinion, these statistics may be made to prove exactly the reverse. We may fairly assume that, on the whole, the mines in which men are hoisted by cages are very much deeper than those in which men ascend and descend by ladders. Consequently, as the difference in safety, judging by the death-rate quoted, is but slight, the cage would appear safer than the ladder, if the *actual distance traveled* were taken into account. In other words, if the men had ascended and descended the mines now served by cages, there would probably have been more accidents than have actually occurred.

Statistics concerning man-engines must also be taken with a similar grain of salt; for unless the distance traveled is brought into the calculation, the figures may be misleading. Again, the difference in safety between the double-rod and single-rod machines should not be overlooked. In my official report for the year 1879, I showed that the mortality rate in Cornwall and Devon from accidents while ascending or descending by ladders was on an average 0·21 per 1000 during the seven years, 1873 to 1879, whereas with man-engines (all of them single-rod machines), "the death-rate was only 0·14 per 1000, in spite of the average distance traveled being greater." I, therefore, do not consider, that it has yet been proved that the *single-rod* man-engine is more dangerous than ladders, when due allowance is made for the depths to and from which men are conveyed. I am, sir, your obedient servant,

C. LE NEVE FOSTER,
One of H. M.'s Inspectors of Mines.

LLANDUDNO, NORTH WALES, Oct. 19, 1882.

Utilizing the Waste Gases of Coke-Ovens.—Abroad, they are going in good earnest at the problem of utilizing the waste gases of the coke-ovens. The French have been the first to make it a commercial success, and the English and Germans are now following. The latest improvement in this direction is a special oven designed by Dr. Otto, who has been running a number at the Holland colliery, near Wattenscheid, Germany, and by which he gathers both the tar and the ammonia-water in the gases from coking coal. According to returns recently published for the months of June, July, and August, the quantity of tar recovered was 3·13, 3·90, and 3·81 per cent, respectively, of the weight of the coal, yielding per car-load of ten tons, 14, 17·40, and 17·10 marks, or an average of 16·17 marks per car. The value of the ammonia-water averaged 10·93 marks—a total, therefore, of 28·03 marks. As the raw coal is worth about 60 marks at the pit's mouth, it will be readily seen that the receipts from the by-products in coking are quite a heavy item, and that they are capable of paying for interest on a heavy investment in the way of a larger or more complicated plant.

NATURE AND MAN.

LINES READ AT THE BANQUET TO THE AM. INST. OF M. E., DENVER, AUG. 29, 1882.

By R. W. Raymond.

When Nature chose her citadel,
She took an unknown land;
On either side, as sentinel,
She bade an ocean stand.
They muttered hoarsely, "All is well,"
And paced the lonely strand.

Then over all the earth she spread
Her forests dark and old,
Save where her rivers flowed instead,
Or prairie billows rolled—
Another ocean, full of dread,
And perils all untold.

Beyond, with multitudinous crest,
Her mighty mountains rose;
Deep cañons scarred each shaggy breast,
While on each head the snows
Of age and undisturbèd rest
In silence did repose!

Queen Nature glanced o'er peak and plain:
"No foe," she said, "I fear!
My lightnings cleave the rock in twain;
I'll hide my treasure here!"
And lavas flowed, to make again
Her footsteps disappear.

But vainly 'gainst man's bold attacks
Such safety could she claim;
For lo! along the ocean tracks,
The gleam of white sails came,
And in the forest rang the ax,
Or roared the fatal flame.

Man cleft the prairie with his plow;
The rivers swift he spanned;
Undaunted, from the plain below,
He climbed the mountains grand,
And, spite of lava or of snow,
Queen Nature's footprints scanned.

In vain the strength of rocky vault
Beyond the light of day;
He burst through all with rude assault,
And bore his prize away;
He could not fail, he would not halt,
No power dared bid him stay!

The eagle watched him from the sky,
The panther from his lair;
The lithe coyotè lingered nigh,
And eke the sleepy bear;
A speck showed on the summit high
The mountain sheep was there

Queen Nature also gazed, intent:
Quoth she, "This creature, man,
Hath followed wheresoe'er I went,
And read my subtlest plan:
Since I may not his work prevent,
I'll help him all I can!

"I'll bid my snows yield crystal dew
His thirsty lips to wet;
On many a hill I'll bring to view
My stores of hidden jet;
I'll cut, to let his railways through,
My cañons deeper yet.

"With glittering dust I'll strew the way
To guide his search aright,
While overhead I cause to play,
In beauty pure and bright,
The golden radiance of the day,
The silver sheen of night!"

In troops he comes. His cabins soon
By many a gulch are seen:
His stamps play out a merry tune
In many a cool ravine;
His bullion matches sun and moon
In gold and silver sheen.

His hammers smite the topmost crags
Around the eagle's home;
His chimneys flap their flaming flags
Against the heavenly dome;
Like lavas stream his glowing slags,
His blasts like earthquakes boom!

His happy children laugh and sing
Beneath the shining skies;
His bells of joy and worship ring;
His prayer and praise arise;
His love, all labor hallowing,
Blends home with paradise!

Dost query, in what favored spot
Was wrought this fair design,
Where, in one blessed plan and plot,
Nature and man combine?
Hark, Colorado calls, "*This lot,*
This happy lot, is mine!"

OFFICIAL STATEMENTS AND REPORTS.

THE VERMONT COPPER COMPANY, ELY, VT.

The copper mines at Ely, Vermont, are among the oldest worked in this country, having been opened as early as 1820, by farmers, and worked in a desultory way until 1853, when they got into the hands of New York parties, who organized the Vermont Copper Company. Until 1866, nothing but mining was done; then smelting of the ores was introduced; and from 1870, when the product was 943,461 pounds of copper, the quantity made rose steadily, until it reached 3,186,175 pounds in 1880. It is a strange fact that little was known of the magnitude of its operations except to a few, which can be accounted for only by the circumstance that the company was a close corporation, and that the entire product went to one refiner, who was also a manufacturer, and against whose interest it was to make much ado about the work he was doing. The mine went through an ordeal of litigation, from which it has emerged with clear titles, and this year was reorganized, the property being taken by the new company, having the same title, at a valuation of $1,500,000. This capital is represented by $200,000 first mortgage bonds, Series A, bearing six per cent interest; $300,000 second mortgage bonds, Series B; and one hundred thousand shares of stock, par value $10 each.

From an elaborate report by the general manager of the new company, Mr. F. M. Cazin, M.E., dated August 1st, 1882, we take the following general facts. We are indebted to Mr. Cazin for a statement of the operations of the new company for the first quarter, to which we shall refer at greater length.

The Ely mine works a deposit of cupriferous pyrites, being one of a number of chimneys in a mineralized zone in Huronian calcareous mica-schists. The chimney worked has been followed on an incline of 24 degrees to a depth of 2300 feet on the dip, showing it to be very irregular both in thickness and in width, pinching down to 6 feet in thickness and 50 feet in length on the strike, and widening to a thickness of 60 feet, and a length on the strike of 350 feet. The mine has been opened out and worked in a very poor fashion, it seems, and only such ore was taken out as ran above three per cent in copper. The ore was dressed by hand to an average of six per cent, one third of the product of the mine going to the dump as waste rock, of which a considerable quantity had accumulated when the new company assumed the management. Formerly the culled ore was roasted in heaps, and was then treated in small blast-furnaces, the matte concentrated and converted into black copper, which was refined by the Ansonia Brass and Copper Company. Such was briefly the status when the new management took charge. The latter proposed the following reforms: Concentration of second-class ore on hand and produced by current mining by a mill put up by parties identified with it, for a return of not more than $1 per ton of crude ore, or less than hand-sorting had cost, with the understanding that the Vermont Copper Company have the supervision and control of the mill and the privilege of buying it at cost. This mill, we understand, will be partly completed by the 15th of this month, and the whole of it is expected to be in running order by the 15th of December, with a capacity of working 120 tons of crude ore per day. In the metallurgical department, the large number of small furnaces has been replaced by two Rachette furnaces now running, which are capable of smelting also crude "fines," which the older ones could not handle. English blister and refining-furnaces are to do away with the uncertainties of matte smelting in German cupolas. Mr. Cazin says:

"The main reliance of the business in future should be on the second-class ore, which, on account of the process applicable (mechanical ore-concentration), could be made into copper cheaper even than the first-class ore (carrying mundic chiefly). The mine in its present state showed several thousand feet of stoping face of this second-class ore warranting a production limited only by the present hoisting capacity. It had been the experience of the mine for more than a decade past, that the first-class ore obtained with the second-class ore had paid all the mining expenses; also, that in no part of the mine second-class had been opened out without also finding first-class simultaneously, paying, as stated heretofore, the total mining cost. During the first quarter of the operation of the new company, this has been verified again."

These preliminary statements will suffice to explain the following summaries of the work during the first quarter by the mining captain, Mr. H. A. Wheeler, and by the consulting metallurgist of the company, Dr. Edward D. Peters, Jr., who is well known as an authority in this special field.

The character of the ore named, and the cost, are shown in the following table, which we compile from Mr. Wheeler's statement:

	September.	August.	July.	Average first quarter.
Total product, first, second, and third-class ore..	1,361 tons.	1,563 tons.	1,199 tons.	1,374 tons.
Product first and second-class	580 "	747 "	510 "	612 "
Of first and second-class ore the percentage of first-class ore was	81·5 p. ct.	81·6 p. ct.	82 p. ct.	82 p. ct.
Assaying in copper	6·8 "	6.6 "	7·7 "	7 "
Of first and second-class ore the percentage of second-class ore was.	18·5 "	18·4 "	18 "	18 "
Assaying in copper	1·76 "	3·12 "	2·4 "	2·43 "
Cost of delivery of dressed ore on the roast-bed:				
For mining	$11.57	$9.32	$10.47	
For dressing	1.74	1.53	1.67	
Total	$13.31	$10.85	$12.15	$11.99

The cost of mining and dressing given above is put entirely on first-grade ore, of which two classes, coarse and fines, known at Ely as A and B, are made. The remainder of the ore sent out of the mine, designated as classes 2 and 3, has not been utilized in the past. It amounts to from 40 to 60 per cent of the mine product. The second grade, or better portion of this waste, amounting to about 20 per cent of it, assays from 1·5 to 2·25 per cent of copper, while the third grade runs 0·5 per cent. Although it seems that it is proposed to treat this very low-grade ore, and although, as will be seen farther on, it is regarded as an asset, we have nowhere in the reports found any direct statement how this is to be done profitably.

On July 1st and on October 1st, the quantity of copper-bearing material on hand was as follows:

	July 1st. Quantity. Tons.	July 1st. Pounds copper.	October 1st. Quantity. Tons.	October 1st. Pounds copper.
Ore on roast-beds (7·3 per cent)	1,132·17	165,297	866·84	126,558
Green fine ore (4 per cent)	3,000	240,000	2,157	172,560
First matte	255 (18 p. c.)	91,800	395 (12 p. c.)	94,800
Concentrated matte (50 per cent)	75	75,000	35	35,000
Second-class ore (2·5 per cent)	.....	.....	501	25,060
Old wash-house dump (1·5 per cent)	30,000	900,000	30,000	900,000
East dump (0·5 per cent)	35,000	750,000	75,000	750,000
West dump (0·4 per cent)	50,000	400,000	50,000	400,000
Dry-house dump (0·75 per cent)	15,000	225,000	15,000	225,000
Total	.....	2,847,097	.....	2,728,978

The copper in the products and dump ore on hand on July 1st was estimated at $516,036.33, on which we are told a margin of at least one half can be obtained by the modern methods of treating copper ore.

During the first quarter under the new management, the furnace treated 2119 tons of roasted first-class ore, 227 tons of rich fines, and 882 tons of "green fines" from the old reserves, and produced 304,859 pounds of copper. Mr. Peters bases his calculations of the cost of smelting on the following. The mine can produce forty tons of first-class ore, averaging 6 per cent of copper; 8 tons of second-class ore, holding 2·5 per cent; and 32 tons of third-class ore, running 0·5 per cent. The latter is to be treated at some future time, it being better policy to treat the richer ore from the wash-house dump, of which there are 30,000 tons on hand. The 8 tons of second-class ore and 92 tons of this dump ore will keep the concentrating-mill up to full capacity during the first month. On this basis, Mr. Peters estimates the yield of the concentration-mill as follows:

8 tons of 2·5 per cent ore into	10.0 ton of	20.00 per cent concentrates,	400 pounds	copper
92 " 1·5 " " "	8·3 "	16·66 " "	2,765 "	"
	9·3 "		3,165 "	"

We are not familiar with the concentrating process adopted at Ely; but we feel confident that the managers will not succeed in getting 3165 pounds of copper out of ore holding only 3160 pounds. We do not know the character of the ore; but we do know that there must be some loss, and probably a heavy one, especially when the concentrates are to be brought up to so high a grade. Dr. Peters estimates that, after the first month, the mill can treat 120 tons, and in a similar manner to the above gets 11·09 tons of concentrates, holding 3760 pounds of copper. To this he adds 40 tons of first-class ore, holding 4800 pounds of copper, and arrives at 51 tons of ore, which can be smelted in one Rachette furnace. The second Rachette furnace is to be employed in smelting the 2157 tons of "green fines" which remain, at the rate of 30 tons daily. With an average of 4 per cent, this would make an additional product of 8560 pounds of copper, giving a total yield of 10,960 pounds. The following is Dr. Peters's estimate of cost. His yield and profit will in reality be lower, because the quantity of copper produced will be less, the losses in concentration having been neglected:

MINING COSTS, BASED ONLY ON THE FIRST-CLASS ORE.

40 tons at $13.31	$532.40
Transport of 112 tons ore to concentration-mill	11.20
" concentrates to furnace	1.20
" 30 tons fines "	3.00
Smelting cost of 40 tons roasted ore at $5.48	219.20
" " 11·09 tons concentrates at $8	88.72
" " 30 tons green fines at $8	240.00
Total	$1,095.72

YIELD.

10,960 pounds copper at only 15c., to allow for administration, freight, refining, etc	$1,644.00
Profit	$548.28

ILLINOIS COAL PRODUCTION.

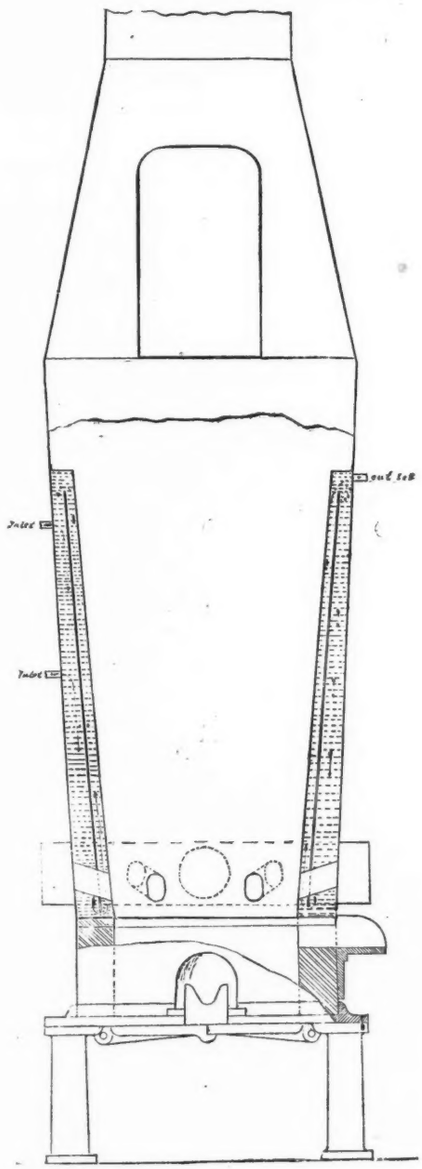
The Chicago *Tribune's* special correspondent at Springfield, Ill., sends that journal an elaborate synopsis of the forthcoming report by the State Bureau of Labor Statistics on the Coal Producing Interests of Illinois. From this, it appears that Illinois is second only to Pennsylvania in its production of coal. Ohio has heretofore held this position. The statistics of Illinois coal interests, taken from the census reports of 1870 and 1880, form bases of comparison, and certainly indicate a very rapid growth of the industry under consideration. In 1870, there were 322 coal-producing establishments in the State. The total grew to 590 in 1880, and, according to the late report, to 704 in 1882. The number of men employed in 1870 was 6301; in 1880, was 14,078; and in the current year, it is 19,420. The number of tons of coal produced has increased from 2,624,163 in 1870 to 6,115,377 ten years later, and to 9,115,653 during the year ended June 30th, 1882. The increase during the past two years is thus shown to nearly equal the entire increased output in 1880 over 1870, and to be fully 50 per cent of the total production in 1880. The total amount of capital employed in the last year was $8,230,183, and the average value of coal at the mines, per ton, is given at $1.46. The report adds that forty-six counties in Illinois are producing coal at the present time. The customary details respecting character and efficiency of the plant used at the various mines, and the social condition of operatives, together with their modes of life and kindred data, are to be found in the report, which reflects great credit upon Colonel John S. Lord, the new secretary of the Illinois Bureau of Labor Statistics.

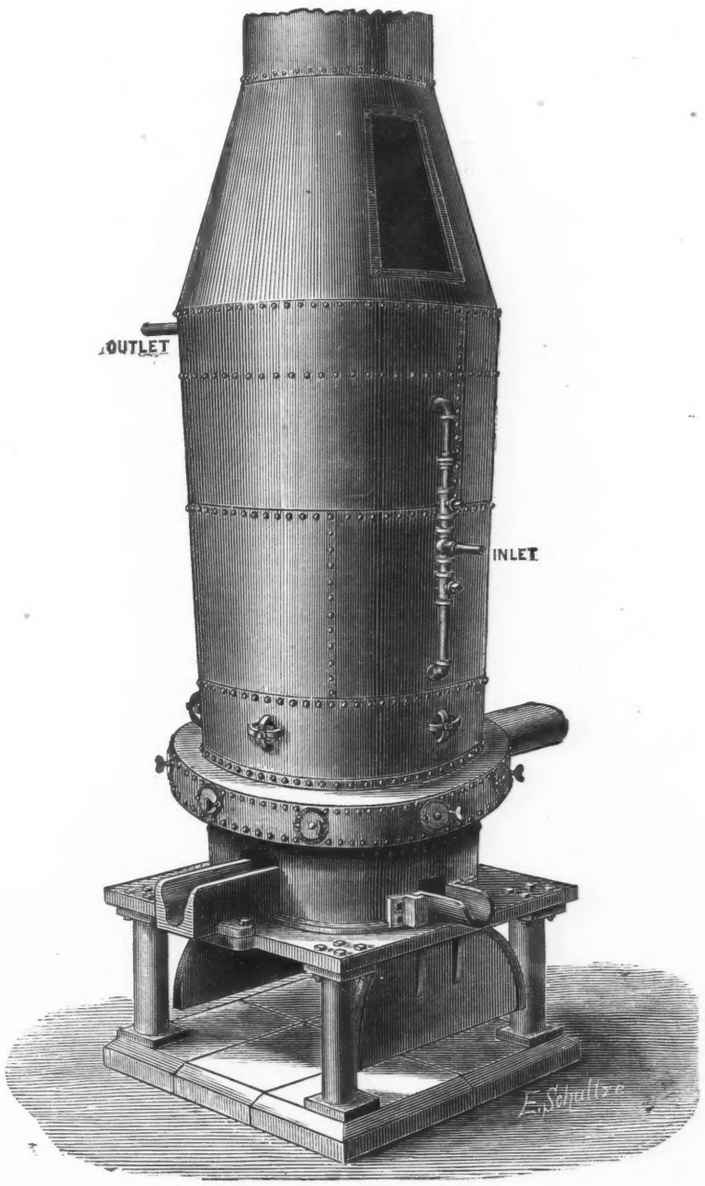
Underground Telephone Wires.—There is a good deal of unreasoning agitation in regard to putting telephone wires underground, and the legitimate and feasible plan of subterranean telegraph cables, at least in cities, is assumed, without any knowledge of the facts, to be applicable to telephone wires also. We are assured by practical electricians of high authority that it is impossible to work underground telephone lines under the conditions prevailing in our large cities, and any steps to secure by legislation the removal of the wires from our streets should, so far as they affect telephone lines, be preceded by an inquiry whether or not it is at all possible.

THE PACIFIC COPPER SMELTER.

During the past two years, our columns have furnished ample evidence of the activity in copper mining in Arizona and New Mexico particularly. The high grade of the surface ores found, and their character, admit of simple smelting operations compared with those requisite in other copper-producing districts, the bulk of the ores being convertible into a high grade of black copper in one smelting. Often in an almost inaccessible region, the miners looked to simplicity and cheapness both in first cost and in running expenses, inclusive of repairs. The outgrowth of this demand has been a typical furnace, designed by Messrs. Rankin, Brayton & Co., of San Francisco, Chicago, and New York, which has undoubtedly contributed much to the development of the industry. The special details embodied in the design have been covered by patents in this country, in Mexico, and in Australia. A glance at our illustrations will suffice to show that the furnace has the general features of an ordinary cupola, with drop-bottom; the latter, we believe, until now rarely applied in copper smelting, though quite generally used in ordinary foundry practice. The chief feature of the furnace is the water-jacket, which, it will be seen, is made to surround the entire shaft instead of being limited as usual to the smelting zone. The water circulation through it is provided for in a special manner fully illustrated by our section. This is an inner partition or circulating plate within the water space, held in place by riveting through. An annular space is left between the upper and lower edges of the circulating-plate and the bottom and top of the jacket. The flow of the water through the two inlet-pipes to the outlet-pipes is shown by arrows in our section. The special object of the construction is to create so active a circulation of water that the entire water-jacket is not only maintained at a uniform temperature, thus preventing the contraction and expansion so conducive to leakage, but also with mineralized water no incrustations are formed. It is well known how quickly burning out is the consequence of the formation of scale, and as in many Western mining camps this has often occurred, there are many who have condemned water-jackets without giving them a fair trial. There is no doubt that, as in ordinary steam-boilers, the creation of an active circulation by a proper design like that of Messrs. Rankin, Brayton & Co., overcomes this difficulty.

Another feature of this smelter, which Messrs. Rankin, Brayton & Co. claim secures a perfect delivery of the blast to every part of the charge and produces a uniform melting area, is the arrangement of the tuyeres, which will be noted by referring to our section. As will be seen, they pitch downward and are oblong in section, thus delivering the blast in a solid body toward the center of the hearth. This, it is claimed, is conducive to rapid smelting and fuel economy.





THE LOSS OF PRESSURE FROM FRICTION OF THE AIR IN PIPES.

The growing application of air for the working of rock-drills and the transmission of power to underground hoisting-engines, etc., in mines, makes the question of the reduction of pressure from the friction in the pipes a matter of considerable importance to those using power in that form. We have before us the records of two very elaborate series of experiments on this subject, the one made by M. E. Stockalper in the St. Gothard tunnel, and the other by B. R. Förster. Full details of the former are given in the *Revue Universelle des Mines*, and of the latter in the *Jahrbuch für das Berg- und Hüttenwesen in Sachsen*.

M. Stockalper made his experiments with two pipes—one, cast-iron, 5000 yards long and 7·8 inches in diameter; and the second wrought-iron, 570 yards long and 5·8 inches in diameter. He comes to the conclusion that, to calculate the loss of pressure, it is sufficient to treat the question as if the pipe contained water flowing at the same velocity as the air, and to reduce the loss of pressure found from water in the ratio of the density of the compressed air to that of water. In the following formula, which he adopts, J is the loss of pressure per yard, l the length of the pipe in yards, Q the cubic feet of air passing per second, which may be readily calculated from the strokes of the air-compressor, d the weight of one cubic foot of air in ounces, and a a co-efficient given in Darcy's table, dependent upon the diameter of the pipe. The total loss of pressure in a

pipe of given length is thereupon found by substituting values in the formula:

$$J \times l = \frac{a}{1000} \times Q^2 \times d \times 0{\cdot}000733 \times l$$

Darcy's table is as follows:

Diameter in inches.	Co-efficient a.	Diameter in inches.	Co-efficient a.
0·394	58,395,000·00	7·087	9·918
0·787	1,169,250·00	7·480	7·529
1·063	222,800·00	7·874	5·785
1·181	125,155·00	8·268	4·509
1·575	26,280·00	8·504	3·9 3
1·968	7,937·00	8·661	3·555
2·126	5,267·50	9·055	2·836
2·362	3,010·40	9·445	2·280
2·756	1,333·00	9·842	1·853
3·150	661·00	10·236	1·517
3·189	619·30	10·630	1·252
3·543	356·90	11·024	1·042
3·937	206·20	11·417	0·871
4·252	138·13	11·811	0·734
4·331	125·62	12·205	0·621
4·724	80·00	12·598	0·528
5·118	52·92	12·795	0·448
5·315	43·53	12·992	0·452
5·512	36·11	13·386	0·339
5·905	25·32	13·779	0·335
6·299	18·15	14·173	0·291
6·378	17·03	14·557	0·251
6·693	13·31	14·961	0·221

M. Stockalper's experiments show that his formula agrees more closely with the results of practical experiments than those of Pecqueur, Morin, Arson, or Weissbach, and that the calculated loss is greater than it is in reality.

Herr Förster, who has made experiments on the loss of pressure at varying initial pressure, velocity of air, and diameter of pipe, confirms the accuracy of Stockalper's formula, which may therefore be accepted as a safe basis for the loss of head in long pipes, though it yields results considerably lower than those given by ordinary formulas.

ALEXANDER LYMAN HOLLEY.

A Memorial Address, by R. W. Raymond.

[NOTE.—The following is the full address, as written for publication. The address, as actually delivered, without manuscript, in the Turf Club Theater, November 1st, was necessarily briefer.]

MR. PRESIDENT; GENTLEMEN OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, AND THE AMERICAN INSTITUTE OF MINING ENGINEERS; LADIES AND GENTLEMEN:

The memorial session, in Washington, at which I was first designated for the duty of this evening, was chiefly devoted to the multiform expression of sorrow. From a score of speakers, who had known Mr. Holley in various stages of his career, came tributes of affection, honorable alike to him and to them. Among them all, none uttered words more heartfelt and impressive than did the venerable Ashbel Welch, who, by reason of official position, as well as years and character, would doubtless have been called to preside over this meeting, had not a more potent message summoned him meanwhile to a higher seat. Nestor mourned over Achilles, slain in the midst of the battle; and now Nestor, too, from the peaceful life of an honored old age, has passed away.

But neither this more recent, nor that earlier, grief is the theme of the present hour. However inadequate to the task the orator of to-night may prove, it was fitting that some one, waiting until the first outburst of emotion had died away, should attempt a calm review of the life and works of Alexander Lyman Holley; that Friendship, bewailing her loss, should give way to History, counting her gain; that the achievements of the departed should be recognized and valued, and his example studied. Was he greatly successful? How did he win success? How much of it was born with him; how much thrust upon him; how much earned by him? And if his own hands wrought out his fame, is there any thing in the method of his preparation and practice that others might imitate with profit?

Mr. Holley was born at Lakeville, in Salisbury, Conn., on the 20th of July, 1832. His father, Alexander H. Holley, subsequently Governor of that State, was a native of the same village. His mother, whose maiden name was Jane M. Lyman, was one of the Lymans of Goshen. The experts in New England genealogies will not need to be told that, on both sides, he came of a good stock—such as, by a combination of enterprise, intelligence, and high principle, has made New England great. The mother could, indeed, bestow upon her son nothing more than the legacy of inherited character, for she died a few weeks after his birth. But her place was supplied by the second marriage of his father, three years later, to Miss Marcia Coffing, whose affection, bestowed freely upon her stepson through twenty years, was as freely returned by him. Their correspondence, some of which has been preserved, shows that their personal intercourse was intimate, and that this excellent lady, though burdened with the cares of a large and hospitable household, never forgot to be a true mother to this son of her adoption, as well as to the children born of her. No doubt he was much indebted for noble impulses and principles to the influence of this devoted woman.

For two or three years of his early boyhood, he attended the district school near his father's house, and was then advanced to the Academy, to which he walked, a little more than a mile and a half, every day, winter and summer. In later life, he was accustomed to allude to this regular exercise as having laid the foundation of the fine constitution which enabled him, for so many years, to work so hard and yet so easily.

From the Academy in Salisbury, he went to another, under the care of Mr. Simeon Hart, at Farmington, Conn., and, after a year or more, to Williams Academy, then directed by Mr. E. W. B. Canning, at Stockbridge, Mass. From Stockbridge he went to Bridgeport, Conn., to prepare for Yale College, under Rev. Henry Jones. According to the dates and internal evidence of his boyish letters, the above order is not strictly correct. I find him at Stockbridge in 1846 and 1847, at Farmington in 1848, at Bridgeport in 1849, and back at Stockbridge in 1850. For our present purpose, the question is not important, except as it shows an early trait in his character—a restlessness, born of versatility and genius, which under less judicious training might have wasted his life.

Ample and interesting materials tempt me to more detailed description of his boyhood. But I must be content to mention, and briefly illustrate, its leading characteristics. First among these must be named the normal, healthy physical activity and the overflow of mirth and high spirits which made him a leader in boyish sports and adventures. Where the others climbed with ostentatious courage up to the belfry of the academy, he, at the first trial, mounted above it and stood on the gilded ball, which no foot had pressed before. He hangs over precipices, takes long foot-journeys, and revels in the mere consciousness of life and strength. Strikingly handsome as well as athletic, he is naturally a leader among his comrades. In all sorts of home amusements, too, his merry ingenuity makes him invaluable. Many of these, such as charades and rhyming games, were intellectual; others were mere pranks—such as the match between him and a friend, "who could eat the most pancakes," of which the kitchen was the scene, the cook being coaxed into complicity, and the dog, wagging his tail behind the combatants, received from each as many segments as could be surreptitiously bestowed without the knowledge of the other; or the occasion when, having constructed a rustic bridge over the brook, Holley forced the entire family to march over it in solemn procession, while he sat by, fantastically dressed as a troubadour, and played the guitar.

Let no one despise this light-hearted gayety. It was the early form of that courage which carried him afterward through many struggles and even defeats, with an air of victory that was in itself the promise of victory to come.

To this quality must be added a keen observation and an inborn talent for drawing. These were specially, but not wholly, directed toward machinery, in which he took the liveliest interest. His father having established the well-known knife manufactory at Lakeville, the boy made himself familiar with all the machinery, and during his youth made innumerable proposals of improvement—some of which, being really good, were adopted, while others—no doubt the greater number—were crude and impracticable. When but nine years old, he accompanied his father as far as Niagara, where he was left for a few days with an uncle who was connected with works employing machinery. During the father's absence, Alexander was repeatedly missed by his uncle, who always found him on such occasions in some place where there was a steam-engine, and who long preserved, as a memento of the visit, a little bundle of papers on which the boy of nine had made drawings of the different machines he had thus studied. In a letter written at about the age of fourteen, he describes an excursion with his school-mates to the old Bristol copper mine, six miles from Farmington, and says:

"The steam-engine attracted considerable of my attention, of course. It was splendidly made and fitted, and went so still that one would hardly know that it was in the room. Power, twenty-horse. Mr. S. Hart [his teacher] told the gentleman that showed us around that he would have me draw a plan of the engine from memory, which I have done, and which Mr. H. is much pleased with. He says he is going to send it to the aforesaid gentleman at Bristol."

His letters overflow with revelations of his passionate interest in machinery, and particularly in locomotives. In one of them, written after returning to school from vacation, he indulges in some of the truly good sentiments with which boys are wont to please parents, but which are in this case redeemed from platitude by this picturesque touch:

"It seems as if I should dive and dig and plow, and if that did not succeed, back out and plow again, in my studies, as faithfully as the locomotive, old 'Connecticut' did, this morning in the drifts, with seven long cars, all alone."

In another letter, he speaks of a locomotive which has been wrecked on the Housatonic road; calls it by name, as an acquaintance; says he has walked twice (a number of miles) to the place where it lies at the bottom of a steep embankment; introduces a pen-and-ink sketch of the scene, locomotive and all, to show how difficult will be the return of the engine to the track; and concludes, "I guess the H. RR. Co. will not make money by this operation."

He frequently declares his determination to master the science of machinery, and I find one sentence, in a letter written at fifteen, which seems to be an unconscious prophecy. He writes:

"I have seen, in a newspaper, an account of a man in England who makes steel that will cut iron or any other hard substance without dulling it. I should like to hire out to that man for a year or so. * * * I wish I could learn the art of making steel."

Twelve years later, there was a man in England by the name of Bessemer, of whom he took, in this art, lessons that were not wasted!

In another letter, written from Stockbridge, he says:

"I have been devoting all my leisure time, for nearly two weeks, in making sectional and perspective views of the internal works, machinery, steam-works, etc., of the most improved locomotive engines, showing how the steam is made, applied, and cut off at half-stroke or not (a recent improvement); how the engine is worked every way, in some seventeen different pictures, with explanations filling some eight or ten pages. Mr. Canning is to have them framed and hung up in the Academy. I have explained them in such a manner that any one can understand them, and I really hope that people will look at them, for there is more ignorance among scientific and educated men on this point than on any other. People who pretend to 'know the ropes' can not explain the simplest form of a steam-engine, even with a model. Of mechanics and chemistry, I intend to get the most thorough knowledge, if I have the opportunity (and, in fact, I intend to get it any way), both practical and theoretical. These are the studies I have always liked, and I am bound to investigate and become master of them."

One other characteristic deserves special mention—his talent for debate and literary composition, and his consequent love of them. Let it be said here that his was not an instance of dropsical precocity. His early efforts were not mature, or even surprisingly early. At fourteen, he joined, I believe, his first debating society. I have found, in his handwriting, a constitution and by-laws of the Societas Literarum (symbolized by a Greek Sigma), which bear date about this time, and in their simplicity and brevity are worthy of imitation. The constitution runs thus:

"1. It shall be the duty of each member to try to sustain the society.

"2. Each member shall pledge his word of honor to keep all the proceedings a secret.

"3. The business of this society shall be debating and composition reading.

"4. This society shall support a semi-monthly paper, called the ——." [Name omitted.]

And the following are the by-laws:

"1. The officers of the society shall be a secretary and president.
"2. There shall be as many as eight members in the society.
"3. It shall be unlawful to use vulgar or profane language."

It was not long, however, before, in this congenial sphere, he developed extraordinary activity. I can not forbear to introduce, at this point, the letter which appeared in the *American Machinist* of March 18th, 1882 from Mr. Canning:

"The universal sorrow in the inventive and mechanical world over the recent decease of A. L. Holley prompts me to jot down a few particulars of his earlier school experiences, which go to prove the truth of the proverb, 'The boy is father of the man.'

"Mr. Holley entered Williams Academy at Stockbridge, Mass., in the fall of 1848,* then under my charge. He is still remembered as a fair, fresh-cheeked, blue-eyed, wide-awake boy of sixteen, who pursued studies preparatory to a college course. His geniality, generosity, and overflowing good humor made him popular with his school-mates, and soon gave him the lead, both in and out of school. He excelled in every branch of study; but his chief interest centered in Natural Philosophy and Mechanics. He was a prominent member of a literary society of the institution called the 'Philologian,' in which he manifested talent unusual for his years for debate and free discussion; while his fun-loving propensities found vent in conducting mock trials and in humorous essays and declamations. He established and mainly conducted a periodical entitled *The Gun Cotton*, issued fortnightly on a large sheet in manuscript, which was read by myself from the desk, and afforded great interest and amusement by the variety and spice of its contents. This he edited during his stay at the Academy.

"Though excelling in all the branches of study required of him, his *penchant* for mechanics and invention developed itself markedly when he attacked Natural Philosophy and Physics. Dissatisfied with the meager description in the text-books of the steam-engine, with which he seemed to be better acquainted than the author of the treatise, he at my request made drawings in detail of a stationary engine and of a locomotive, with an accuracy and skill that would have done credit to a professional engineer or draftsman. These I used in demonstration, in preference to the imperfect model among the school apparatus. During one of his vacations, he came up from his Salisbury home expressly to show me a miniature engine of his own building. It was complete in all respects, and of skillful workmanship; and, on being fired up, ran with admirable success. Thus he foreshadowed the devotion to the mechanic arts which so eminently characterized his manhood. One number of his *Gun Cotton*, I remember, was devoted to the description of an aërial voyage made by a machine of his own devising, whose practical workings were related with as much interest as the details of the wonders of sight-seeing it enabled its inventor to describe. This, he prophesied, would be substantially the vehicle of locomotion in A.D. 1950.

"His temperament prompted him to constant activity. There was not a lazy bone or muscle in his body. In fact, his mind was too powerful for his physique; and, beyond doubt, the continued high-pressure at which he drove his mental energy, during all his busy life, materially shortened his days.

"In his reading he was fond—though by no means exclusively so—of works of imagination. Every new invention that fell under his eye received due notice in his *Gun Cotton*. Imaginative works seemed to be the whetstone on which he sharpened his own inventive genius. It is rare that good sense and sound judgment succeed in subduing the *imagination* to become the servant of the *practical*, to the extent realized in the case of Mr. Holley.

"Your brief but comprehensive article in the *American Machinist* of 18th of February follows the career of Mr. Holley subsequently to his college life. Doffing the student's toga for the workman's blouse, he put to the test the best theories of his book-learning, and showed the world, to its immense benefit, the unusual example of a man possessing the combination of enlarged education, inventive talent, and practical common sense. E. W. B. CANNING.

"STOCKBRIDGE, MASS."

To this life-like picture, no improving touch could be added, unless by the hand of the subject himself. One or two quotations from Holley's letters of this period will be their own sufficient apology.

Writing from Bridgeport, at seventeen, and giving, as was his custom, an account of his doings, he says:

"I have written the following compositions:
"1st. A Dream, personifying Wisdom (a judge), History, Chemistry, Mathematics, and Philosophy, who speak of their respective merits. Philosophy wins the prize. 6 pages of foolscap.
"2d. A Fragment (revised from a former) containing a few thoughts like those in Gray's Elegy. 2 pages.
"3d. History of Audax Promptusque. A novel. 26 pages.
"4th. War (revised from a former). 4¼ pages.
"5th. Pride (rather disconnected). 2 pages.
"6th. A Picture. 6¼ pages. On this I have spent in all at least twelve hours' hard study, and it is the best composition I ever wrote. I would like to have you read it.
"7th. A Dream and Consequent Wish. The best I ever wrote, except No. 6.
"8th. A composition in blank verse. Unfinished."

In January, 1850, he writes from Stockbridge:

"I write you in great haste, to say, that at the close of the term we're to have an exhibition. I was first chosen to write and speak a valedictory oration. Then I have to write the *Gun Cotton*, and a continuation of a treatise on the manufacture of pocket cutlery (which I have been at several weeks), for the *Experimentor*, another paper—all this for the day of exhibition. Then the forenoon of the day is to be occupied by a Lawsuit. The Philologian Society have, for that occasion, resolved themselves into a 'high court of inquiry,' and I am chosen for 'State's Attorney,' to prosecute a man for 'assault and battery.' This will be public. Besides this, I have to write a continuation of my treatise on cutlery for the *Experimentor* next week, and to write two numbers of another paper I publish, called the *Locomotive*. Then I have to prepare also for a public trial next week in the Philologian, also to learn (probably) a part in a dialogue for Exhibition, and all this in addition to Latin and Greek. My request is this, that I may omit my music lessons till next term, as I have my hands full, and shall burn some of my irons, if I don't look out.

"I shall also want a new coat to expatiate in on the great day. Please send as soon as convenient."

The treatise on cutlery, above alluded to, was subsequently accepted by Poor's *Railway Journal*, and published in successive numbers of that paper during the summer of 1850. It is a curious compound of learned extracts from such books of general chemistry, etc., as were accessible to the young author, and admirably clear and vivid descriptions of the actual processes of the manufacture with which he was personally familiar. In his ambitious view, the subject of pen and pocket cutlery includes the natural history and chemical and physical relations of iron, steel, brass, copper, zinc, German silver, tortoise shell, etc. No element is mentioned without a conscientious statement of its chemical equivalent, and the manner in which it is produced or found in nature. But these adornments of the essay, probably its principal merits in the author's opinion, are worthless in comparison with the practical details, which no doubt chiefly commended it to the publishers.

This was, I think, the first literary work for which he received pay. In an exultant but apologetic letter written in July, 1850 (after the publication of the treatise had begun), he confesses that he had made a surreptitious journey from Stockbridge to New York:

"I walked before sunrise to West Stockbridge, went to Hudson and down the river on the Alida. Called on Mr. Poor, who was sorry he had paid no attention to my dozen letters, and as a compensation gave me the equivalent of about sixty dollars for my essay. That is, he gave me $25 in cash and 27 copies of every chapter of the article, thus making probably 243 *Railroad Journals*. * * * He says I had better enlarge the essay a little, and come down in vacation to New York, when he will introduce me to a house in New York, who are perhaps the largest publishing house in New York. He thinks I can sell the copyright. I saw the steamship 'City of Glasgow' sail. City in mourning for General Taylor. Left city at three o'clock. We had two locomotives and eleven cars full out."

One further trait, and our picture will be as complete as circumstances will permit us to make it. I have already alluded to the restlessness of Holley's mind. He is drawn by many tastes and ambitions in many directions, though through it all, his dominating tendency may be perceived. He is impatient of processes and longs for results. Sometimes his distaste for the drudgery of books and the discipline of school rises to despair. Thus, he writes from Bridgeport, in 1849, to his father a letter from which I take the following extracts:

"I have had every thing done for me that could be done—every thing that kind parents could possibly do for a son. I have made three trials, and each one has proved unsuccessful—three trials to get an education; and now, having spent so much of your money and trouble, I wish to make one trial at work; and I know I can succeed. * * * It is a waste, sir, I think, to send me to school. It is not in my nature to deprive myself of an education if I was able to get it; but I see the folly of it. I have tried as hard as I could to learn out of books, but it is folly in the extreme. *If* I have any talent at all, it is for writing. When I lay myself out and spend many hours on a composition, I can, by copying all the good parts, make out quite a piece; but this is *all* the talent I have got, *any way*. Now I have got hands, and can work. * * * There is John [his brother], a natural scholar, who could not bear hard work, and who will make, by his mind alone, a great man; but I can work, and do nothing else to any advantage. * * * I am very anxious, of course, to hear your decision, and will come, if you say so, with a right good-will; but if not, it all looks *dark* ahead, and I do not know what I shall do. * * * P. S.—Please write to-morrow, as I am very anxious to hear."

The key to this exaggerated confession of failure doubtless lay in the fact that at this time he was preparing for the classical course at Yale, and was giving a good deal of trouble to the Rev. Mr. Jones. Moreover, going home to work meant escaping from the bondage of Latin and Greek to the whirring wheels, the engines, the forges, the tools of *that knife-factory!* On one hand, purgatory; on the other, Paradise: what marvel that to his vision the disciplinary pains of the former took on the hopeless hues of utter despair?

I violate, in this one instance, the rule I have elsewhere pursued in the treatment of private correspondence intrusted to me, by quoting from the reply to the foregoing letter:

"I am very sorry to see you yielding to so desponding a tone of spirit. You are not quite the dunce you would attempt to make me believe you are, nor have all your experiments to secure an education failed, as you would intimate. You certainly know more than you did, when you commenced your career abroad, about books and about men and things. I have certainly had two or three reports to that effect. Why then do you despond? I have not complained of your scholarship in writing to you. * * * This complaint has been on your part and not on mine. * * * No, my son, you must not despond. If dark days now appear, brighter ones will follow. * * * Have you not often heard me say how grateful I always felt to my father, that he did not indulge me in my propensity for change? I think I should have been a ruined man if I had been permitted to hop from this thing to that, and hither and yon, just as fancy for the time might dictate. I wished to leave the store and engage in farming. He said no, and I felt hard about it; but I have often since thanked him for that *no*. Besides, suppose you were to leave school and engage in business systematically (which you never have done yet) and were subject to the drill which you must be, when that time does come, would not that after a while be as irksome as any thing else? * * * You are in the right way now, my son, and your future happiness, usefulness, and respectability depend upon a continuance in this. Of this, I assure you, as a father most earnestly desiring your happiness as well as usefulness.

"If you are not ready to enter college at the next commencement, then go on till you are ready. There are more years to follow. Only make good use of your time, and we shall all be satisfied. * * * You say you think you have *one* talent at any rate. I think you have more; but cultivate *that* at all events, and do all you can toward cultivating others. The cultivation of this very talent may yet be essential to your success in life.

"But always remember one thing, my son. It is an injunction of the Most High. Man is to earn his bread by the sweat of his brow. From this there is no escape. Therefore we must keep on in our employments, whatever they may be; and the more cheerfully we do so, the happier we shall be. Brighter days are before you, and you will so see it ere long. Be contented, then, and make us happy and yourself happy, and all your friends happy, by a cheerful perseverance in the duties before you, which are not *always* study, but in after-years the *fruit* of study, and all will be well."

An excellent letter; and there were many more of the same sort. But wiser than wise words was the step that followed; for the father, while holding a firm hand upon these wayward moods, was not blind to the needs and impulses of the genius beneath them; and in 1850, Brown University having just established a scientific course, Alexander was entered at Providence instead of New Haven. From this time on, nothing was heard of discontent in study. In October, 1850, he writes:

"I have succeeded, by working nights and in odd hours, in making a painting of the fastest locomotive in the city, which I showed to the Professor of Mathematics. He was pleased with it, and asked me to go with him and look at the locomotive, and to explain to him a new invention in locomotive engineering, called 'link motion,' which I did satisfactorily. I considered this quite an honor, as he has explained the steam-engine to classes for a dozen years or more. He then took me into several factories where I could not have gone without him."

Besides the picture above referred to, he finished a working-model of a steam-engine, which the professors assured him was the best they had ever seen. And, what was more important, he invented a new cut-off, concerning which the following extracts are interesting:

"Brown University, November, 1851.—* * * I have noticed Professor Page's engine, of which father speaks. As he says, it will eventually do away with steam, but *not yet*. I understand his magnetic engine perfectly. It is just as capable of improvement as the steam-engine—and more so. Machinists' work

* Mr. Canning forgets his first sojourn at the school. He was certainly there in 1846 also.

is also quite as necessary for it as for steam-engines. At any rate, I have invented an improvement in steam-engines, and it is bound to be patented, if I sell the coat on my back to pay for it, and go without any. I have showed my plans to a man who was four years with Messrs. Corliss & Nightingale, of this place. These men have invented and are making the most improved cut-off engine of the day, and this gentleman says that my engine (that is to be) embraces all their improvements and none of its disadvantages."

"January 14th, 1852.—After many attempts to get time, I have at last succeeded in putting my new cut-off on paper. Professor Caswell says that it will work as well as Corliss's celebrated cut-off. Professor Norton says it is very ingeniously contrived, and is better than Corliss's. To-day I took it to Mr. Greene (of the firm of Thurston & Greene, the most extensive engineers of the city), and he said it would work as well as any cut-off he ever saw. He said I could not get it patented, for this reason: A man, some years ago, got up a cut-off, and in his patent it was provided that he should own all improvements in the cutting off of steam by the regulator, wherein the valve-motion was obtained by any *connection* with the working part of the engine. My cut-off is *entirely* different in principle and form from his and from all others; yet Corliss himself, whose cut-off is different from his and mine, is to-day involved in a lawsuit with the original inventor. * * * I feel satisfied, at all events, that my plan is entirely original, and as good as any body's. * * * I can have a picture and description of 'Holley's Improved Cut-off' circulated in *Appleton's Engineers' Journal* [he means the *Mechanical Magazine*], free of expense, and shall immediately do so. [This cut-off was illustrated and described in the *Mechanical Magazine* in July, 1852. It is a detached escapement, operated both directly by a cam (at the end of the stroke), and indirectly from the governor, at any point during the stroke.] * * * You advised me when I was home to consult Mr. Adams, C.E., of New York, about my oscillating engine. I did consult him, and found that my fundamental improvement, on which the rest depended, was patented in England by a celebrated engineer, some years ago. I thought it all out myself, and never heard of it till I had put it on paper myself."

Although such matters as these occupied much of his attention, he was active in the literary society to which he belonged. A letter to his step-mother pours out his wrath at the injustice to which the college societies were subjected by the President and trustees, when, desiring permission to meet in the evening instead of the afternoon, they were flatly denied. A rebellion followed, but though some of the hot-heads went so far as to incur the peril of expulsion, Holley stopped short. After all, what he wanted was to get an education, and to him these minor issues were not important enough to justify the risk of losing that. So he declined to abet further the revolutionary movement with which he heartily sympathized, and turned his tumultuous feelings into the safer channel of a long, eloquent, and indignant letter home.

It was either before or just after his graduation that he wrote an elaborate essay on "Water Considered as a Carrier," which was published in 1854 in successive numbers of the *Litchfield Inquirer*. It is an exhaustive account of the functions and properties of water as a conveyer of gases, mechanical sediments, dissolved salts, germs, etc., in the vegetable, animal, and mineral kingdoms; of its agency in geological formations, volcanic eruptions, etc. Curiously enough, water is considered as a carrier of every thing except heat. This aspect is omitted altogether, though it is the one with which the writer was at that time most familiar, and was afterward to be most largely concerned. The essay came from his reading, not from his experience. It is creditable to a young collegian; but still more creditable is the fact that he never wrote another like it.

In September, 1853, he was graduated, with the degree of Bachelor of Philosophy. His oration, on "The Natural Motors," is in point of style not notably different from the fervid and florid efforts common to such occasions. Yet it betrays throughout the passion of the speaker for locomotive machinery, terrestrial and marine; and two passages, describing respectively a locomotive and a steamship, show with what assiduous affection he has watched what he describes. Less clear and forcible is his allusion to electricity, the employment of which in the telegraph he represents with "commencement" rhetoric, as "ambitious man, grasping the red right hand of Jupiter!" But he pays a compliment to the caloric engine, as an enterprise which "may yet be consummated in a future neither chimerical nor distant." This was just after the trial of Ericsson's steamer, and before the general recognition of the fact that heated air is useful and economical for small motors, though it can not compete on a large scale with steam. I use the words of the distinguished inventor of the caloric engine—a man whose brilliant list of great successes renders him well able to afford the confession of a failure, and who, in the true spirit of science, has drawn from this disappointment grounds for gratitude. "The marine engineer," writes Mr. Ericsson, "has thus been encouraged to renew his efforts to perfect the steam-engine, without fear of rivalry from a motor depending on the dilatation of atmospheric air by heat." (*Contributions to the Centennial Exhibition*, 1876, p. 438.)

Holley's faith in the genius of Ericsson was confirmed in later years, in connection with the triumphs of the screw-propeller and of the turreted iron-clad. And Ericsson's generous appreciation of Holley appears in a letter written since the death of the latter, and speaking of him as "the brightest ornament of American engineering."

After leaving college, Holley entered the shops of Corliss & Nightingale, at Providence. They were at the time engaged in the attempt to apply to the locomotive engine the principles of the variable cut-off, so successful in the stationary engine. Holley entered their locomotive department, where he served both as draftsman and machinist, and subsequently took the "Advance" out on the Stonington Railroad, where he ran it as engineer long enough to show the practicability of so doing, and, I believe, to effect a sale of the engine. In economy of steam, as shown by indicator diagrams, the "Advance" was superior to existing link-motion and lap-valve locomotives. But the detached variable cut-off was too delicate an arrangement to endure the jar of such rough service. Another arrangement was substituted; but this, too, rattled to pieces; and even in the form finally adopted, the "Advance" was not practically a machine to be enthusiastically welcomed, particularly upon such road-beds as were then characteristic of America.

In his speech on "The Pursuit of Science," at the Hartford dinner of the Society of Mechanical Engineers, Holley revived his reminiscences of the "Advance." Said he:

"The idea began to obtain that science should be pursued not in books, but in things; and I commenced the pursuit of science in and on and under one of the awfullest *things* this world ever saw. It was Corliss's original locomotive, euphoniously called 'The Old Jigger.' This locomotive was possessed of a certain inborn cussedness, which could hardly be the attribute of a mere machine—her spiritual nature was a sort of Mephistophelian cross with a Colorado mule—and as to her physical constitution and membership, a cotton-factory 'mule' was simple in comparison. The Old Jigger had, as nearly as I can remember, 365 valves, one to break down every day in the year. And as to valve *motion*, well, nobody ever counted the number of its pieces. They were as the sands of the sea-shore. Most of them used to jar off, the first few trips of the week, after which all the men in the shop could comparatively keep track of the rest of them. I will say for the Old Jigger that she made the best indicator-card I ever saw from a locomotive; clean cut-off, almost a theoretical expansion curve, and an exhaust as if she had knocked out a cylinder-head. Well, once in a while, after she had been jackassing over the road about four hours behind time, and we had pinch-barred her into the round-house, we used to pull out these indicator-cards of hers, and talk them over right before her, and we would look at her and ask one another why in thunder an engine that could make a card like that would act as if the very old—chief-engineer was in her. And next morning she would rouse up and pull the biggest train that had ever been over the road—ahead of time.

"But she was an inconstant old girl—and lazy, too—used to prefer to work with one side, and always made some plausible excuse for breaking down the other. I remember, one March morning, when nobody was looking, she kicked off about two dozen pieces of her starboard valve-gear, and brought up all standing, over a culvert about ten feet wide and full of ice-water. As I was standing in this culvert up to my middle, disconnecting her eccentric straps, a college professor came along, and rammed his umbrella into me, and asked me to explain to him the difference between this locomotive and any other locomotive! I then delivered my first scientific lecture; and I am now of opinion that its diction would have been modified by a divinity student!

"Continuing my pursuit of science, I left Corliss's works with a knowledge of valve-motion which was simply sublime; and I then proceeded to engraft this knowledge on a locomotive works in the Middle States."

So far, the dinner speech, delivered in May, 1881. How lightly does memory pass over the sad hours of the past! Probably the witty orator would have been as much startled as his hearers, if any voice had recalled to him the period of despondency through which he had passed after leaving the Corliss shop, and before finding employment elsewhere. Messrs. Corliss & Nightingale wrote, under date of March 27th, 1855:

"Mr. Holley has been employed for nearly eighteen months in the locomotive department of our business. He is an accomplished draftsman, and exhibits talent in the designing and application of machinery. During the time he has been with us, he has enjoyed every facility for becoming practically acquainted with the working of locomotives. We should be glad to avail ourselves of his services in our regular business of manufacturing stationary engines. But his mind is on locomotives; and therefore, into that branch of mechanism will he carry that spirit and aim that will insure success. As we do not propose to pursue the locomotive business at present, Mr. Holley leaves us, and carries with him our best wishes for his success."

Armed with this and other introductions, he visited the principal locomotive shops of the West in search of employment, with the result stated in the following letter, written about a month later, in St. Louis:

"I am completely discouraged. I have applied at every place in the Western country where they build locomotives, except one (at Milwaukee), and I am informed that I shall find no opportunity at that place. At Detroit, my letters were of no avail. They wanted no draftsman, only made the locomotive business a minor affair, and did not propose to try to establish a reputation of their own—as nearly as I could understand it. Mr. ——, of Cleveland, had no place for me, and said that if there was any thing in the world he hated, it was patented improvements. Niles & Co., of Cincinnati, had a first-rate draftsman, and could not change. * * * —— & Co., of Cincinnati, only built a few machines and hired a draftsman, as they used a turning-lathe, for mechanical labor only. They get some poor fellow who will work a month or two, and then starve a month or two when they don't want to use him. The Covington, Louisville, and Chicago works have suspended. The shop at St. Louis is a good one; but they could give me no encouragement, though they seemed to be anxious to drive business. They have no draftsman at all, and think that people here are too ignorant to desire any change in the old form, even though it might be an improvement. I even offered to work for almost nothing, at almost any thing, if they would take me in, but was unsuccessful. * * * It is strange that when I have taken such pains to represent myself modestly, and am willing to do any thing and work and persevere to the utmost extent, that when I have got such strong letters, and that when I know that I can build a better locomotive than all the rest of them put together—even in the face of all this, I can not in the whole Western country get a place to earn my daily bread. The idea is damning to a man's spirits; though sometimes it looks so ridiculous that I can not but laugh at the world generally. One thing is certain—I *will* build locomotives; and if my life is spared, I will ultimately place myself in a position where I can look down on every man who has neglected me, and laugh with a good-will at the bad luck which the *improvements* they scorn have brought upon them. It may be a long time before I shall get my head out of water, and I sometimes fear that my spirit will fail me before I see the daylight. If I sink, poor and unknown, I honestly believe I shall drag down with me some ideas of which, however humble they may be, the world is not worthy. * * * I want to visit the Philadelphia, Baltimore, and New Jersey works, and see if I can convince myself and my friends that I am good for something. If I fail in doing this, I am ready to sink; for if there is any thing certain in this world, it is, that I will NEVER *do any thing* permanently for a living, but just this one thing, namely, build locomotives."

It was at the very end of his hopes—in the locomotive works at Jersey City—that he found employment at last. And it was while he was working there that he, most improvidently and most fortunately, married. It is not my purpose in these remarks, devoted as they must be to his professional career and works, to intrude upon the sacredness of his domestic life. Yet the two are not altogether separable. There are those who have not forgotten how the young wife trudged daily with her husband to his experiments with coal-burning locomotives on the Harlem road, or assisted him in the office of the *Railroad Advocate*, or haunted the new Bessemer works at Troy, until he was accustomed to say, when fears were expressed for his health, "Don't be afraid, if I die, *she* can run the concern." More than this: from the date of his marriage we find in his letters no more outbursts of despair, but the cheerful and sanguine courage of a heart anchored in a happy home. Into that home, trouble and death came, as whither do they not come? But they could not banish peace and hope. Many of you will remember Holley's humorous and pathetic address at the Pittsburg banquet of the Institute of Mining Engineers in 1879. Replying to the toast of "The Fellows' Wives," he said, among other things:

"Young man of the school, full of lore and anxious for hire, what is the vista of probabilities that fills your eye? Will you map out the metalliferous veins under the fair landscape, from the ragged outcrops of the upturned rocks? Will you span the cañon, eroded throughout æons, with your gossamer steel bridge of yesterday? Will you compel a river which denudes a continent to build out its own ship-canal through its own delta with its own *débris*? Will you sever

continents to make a highway for commerce? Will you coax out of ores with your deft alchemy the metals which the evolution of ages put in? Will you drive a train from the Orient to the Occident, following the sun, and keeping company with the hours? Ah my dear boy! these things you may do; but they are only means to an end. And that end you shall see down the long vista of the inevitable. There, with eloquent eyes and folded arms, sits a dear little woman. And, my boy, when those tender arms shall enfold *you*, and those eloquent eyes shall flash into your soul the potential caloric of a whole life, then you will know what it is to be the lord of a fellow's wife. * * * Two thousand years ago, the philosopher Callimachus, wandering in the cemetery of Corinth, was arrested by a vision of prophetic beauty. It was only an acanthus plant, confined in a basket and covered with a tile, the struggling leaves curling through the meshes and wreathing themselves in graceful volutes under the covering stone. This was the decoration of a child's grave; but it was the prototype of the Corinthian capital. As out of a little grave grew the glory of decorative art, so out of ah! how many little graves, struggling through the meshes and repressed by the cold marble, perennially bloom the graces and the virtues of the higher life—that long-suffering, that patience, that elasticity, that sweetness, that association of the good and the beautiful, which is but another name for *the fellows' wives!*"

While yet at Corliss's works, Mr. Holley had written, both for the *Polytechnic Journal*, and in Colburn's *Railroad Advocate*, articles on the Corliss engines, which displayed marked ability. Probably it was this which brought him to the notice of Zerah Colburn, the inconstant, erratic, unfortunate, but brilliant and wonderful engineer and author, whose fitful career would in itself be subject enough for a volume. Mr. Colburn had been superintendent of the New Jersey Locomotive Works, and had started in 1854 the *Railroad Advocate*, which may be said to have inaugurated a new era in the technical journalism of this country. From being a contributor to this paper, Holley became a partner and editor. The two men had many things in common. They were in love with the locomotive, and all that pertained to it. Their scientific knowledge had a foundation of practical familiarity with the topics of which they wrote. Colburn was the superior in the range and maturity of his professional knowledge, and it is impossible not to recognize the great advantage, intellectually, which his younger associate derived from this companionship. But in other respects, Colburn was no comfortable yoke-fellow. He could not bear harness. After a year, he sold out to Holley, and from April 19th, 1856, the *Advocate* was published by Holley & Co. In August of the same year, the name was changed to *Holley's Railroad Advocate*, though Colburn still wrote for it occasionally, and for about a year the burden, both of editorial and business management, was borne by Holley. His letters show that it was not light. In January, 1857, he writes that the paper is "filling up with advertisements at $24 an inch;" in February, he is still sanguine, but says that "like all other things, it is slow at first." He adds, "I must be traveling most of the time, and picking up all that is new, to keep up the interest in the paper, and must keep it full of advertisements. I can not edit the paper in New York, or in any less space than several millions of miles." In March, he writes from Lynchburg, Va., that he has progressed slowly, but thinks the trip will be pretty successful. He will have some $300 worth of advertising from Richmond. The country is not so dilapidated as he expected to find it. Things are lax and dirty, but there is a good deal of enterprise in the larger towns. He expects to go on as far as New Orleans and Cuba.

The *Railroad Advocate*, caught in the storm of a great commercial crisis, was sadly battered, if not wrecked. It never fulfilled his hopes, as a business; but we can not fail to see what an education for its proprietor and editor was furnished by this active and continuous association with men and things as well as books and literary labor.

Meanwhile, Colburn, after several unsuccessful ventures in other directions, returned to journalism. In July, 1857, *Holley's Railroad Advocate* became Holley and Colburn's *American Engineer*, and in the following September was suspended and never revived. The cause of the suspension appears to have been the "hard times" of 1857; but the ingenuity and energy of the owners made this the occasion of a new venture. Securing from a number of American railway presidents and from private friends the necessary means, they went to Europe, to study foreign railway practice and to report upon those features of it which would be most important at home. This was the first of thirteen journeys across the Atlantic, made by Holley, every one of which was fruitful of benefit to his country. No American ever went abroad more thoroughly furnished for such a work by nature and by training. If Colburn, on this first trip, showed him how to do it, he needed no teaching afterward.

It was on the return voyage that the Ariel, in which Holley was a passenger, was nearly wrecked, and obliged to put back. The following vivid description is taken from an unpublished fragment found in Holley's handwriting among his papers:

"We merrily sailed out of the Solent, past the Needles, against a stiffening breeze, just as eight bells sounded the New Year. But the barometer fell and the sea rose for six days, and on the tempestuous morning of the seventh, we were awakened by that joint sensation of ominous silence and new motion. The noisy but assuring heart-beat of the engine-room had stopped, and we were rolling over and over. The paddle-shaft was broken just outside the hull; one wheel was banging against the planking, and likely to go to the bottom with its counterbalancing weight; the ship was in the trough of the sea, and the gale had grown to a hurricane. They tried to make sail enough to get steerage-way, but the fore-yard snapped in two. Then the gallant Ludlow threw out a floating anchor called a 'drag,' a big basin, made of a stout and weighted sail, stretched on four spars. This, with our spanker, held her just so far out of the trough that we only got 'pooped' once—then came in the stern-windows, and a foot of water over the cabin-floor, washing away babies, furniture and—hope. I knew the engineer professionally, and I crawled down to his den, and begged him to let me do something to occupy my mind, for I was afraid. But he said there was little to do, except to keep the bilge-pumps running, for she had sprung a leak. Then I crawled up into the cabin again, and saw some men crying and wringing their hands, and some dear women, brave and quiet, taking hold of each other's hands, and looking like angels. That took away my fear; and I made a sort of nest for some little children who were tumbling about with the Ariel's lurches; and I told them stories and worshiped their innocence and their ignorance of engineering which I had spent half a life to learn. So passed the dreadful day and night. We had no regular meals, of course; but the cook scalded some potatoes and himself; and a few of us went into his galley and cooked ourselves and some chops, and in that fun we almost forgot our condition. The next day was Sunday. The hurricane had not abated. The pumps had simply kept the ship afloat. The greater number of the passengers wanted to have a prayer-meeting, and ask the Deity to stop the storm. There was no authorized representative on board, except a Catholic priest, and he was one of the best and truest men I ever met. He kneeled down in the cabin among us all, and, without any ritual or any Latin, he described our peril and our wants in a few graphic and fervent words, which put us in harmony with the situation. Then the storm broke, and the next morning was bright and sunny. For ten days, we sailed and paddled with our well wheel back to Queenstown."

Colburn and Holley's report—a handsome folio, with 51 engraved plates—appeared in 1858, under the title, *The Permanent Way and Coal-burning Locomotive Boilers of European Railways, with a Comparison of the Working Economy of European and American Lines, and the Principles upon which Improvement must Proceed.* This title is admirable, because it exactly expresses the three-fold nature of the work, which comprises a description of foreign plant and practice, a demonstration of American inferiority, and a recommendation of practicable improvements.

The book reflects much credit on its authors in many ways. With characteristic courage and ambition, they issued it in a style which they could ill afford, and which makes it even to this day one of the handsomest of engineering books. It was a bold venture, even outwardly, and its contents were bolder yet. When we remember that Colburn and Holley were abroad less than three months, collecting the materials for it, we are astonished at its completeness and accuracy. They were "tremendous workers." Holley's letters show that after a few days given to the new delights of travel, and the sights in London, he settled down to intense labor, visiting railway shops and offices, and devoting days and nights to writing and drawing. The excellent descriptions thus prepared might, however, have fallen unnoticed in the presence of a public little able to appreciate mere engineering details. It was the "Comparison," made by Colburn, which appealed directly and irresistibly to American railway managers—"counting-room engineers," as Holley was wont contemptuously to call them—with its overwhelming demonstration of the financial economy of the best construction and the best machinery. In 1860, Holley wrote:

"The first half of the last decade was distinguished by the *opening*, as if by magic, of thousands of miles of railway; the last half has been distinguished in revealing the fact that the roads thus open are yet to be built."

This revelation was effectually made by Colburn's "Comparison." It was not enough to show that the annual operating expense of American railways was $120,000,000, against $80,000,000 for the same mileage in England—an excess of $40,000,000; that the annual maintenance of the road-bed cost $33,000,000 here, against $12,500,000 there—an excess of $20,500,000; that the cost of fuel was $18,000,000, against $7,500,000, thus giving as total expenses, $171,000,000 in America and $100,000,000 for the same mileage abroad. Any industrious compiler could present such figures; and the counting-room answer was ready. "Such comparisons could not be made. The conditions were utterly different in the two countries. English lines were very expensively built, and what was saved in current expense was paid out in interest on first cost. The grades were lighter than ours; the traffic was more favorable; there was cheap fuel and pauper labor." This sort of vague *qualitative* talk is what all reforms encounter; and it must be met with *quantitative* demonstration. In all such questions, there is "truth on both sides;" but the scientific inquirer weighs the truth, and ascertains on which side is the ultimate overweight. In this case, Colburn proceeded to discuss in detail all the varying conditions, and to give a precise value to each. He showed that of the superior English economy of nearly sixty per cent in the maintenance of permanent way, only about half was due to favoring circumstances; that of the 44 per cent superior economy in fuel, only 15 per cent could be thus explained; that the necessary difference in first cost was far less than had been supposed. By an exhaustive analysis, he tracked the saving to its sources, and proved these to be chiefly the locomotive and the permanent way. This was an argument which financiers could understand. The press took it up, and drove it home. The leading New York dailies came out with long leaders (mostly contributed by Holley) on the causes of the depreciation in railroad property, and drew from this book overwhelming proofs. The English press, of course, rejoiced in its acknowledgment of English superiority. Even the patriotic rage displayed by some of our journals, regarding this conceited attack on American institutions, helped to advertise the book. Taken together with its successor, Holley's *Railway Practice* (of which I will speak presently), it inaugurated, and did much to effect, a revolution. As to the completeness of the mechanical part of it (which was Holley's special portion), I may here quote a remark once made to me by a leading railway engineer of this country. Said he, "I keep the book in my office still; and frequently, when inventors call on me with their new ideas about rails, and joints, and sleepers, and boilers, and so on, I open Colburn and Holley, and show them their inventions, already described and discussed."

From Holley's letters during 1858, it is evident that he traveled extensively, soliciting subscriptions from railway companies to cover the cost of publishing the report, and also selling other scientific books on commission to cover his expenses. Probably during this period he made the acquaintance of Mr. Henry J. Raymond, founder and editor of the New York *Times*. His first article in that paper was a vigorous editorial on railway management, published November 9th, 1858.

Mr. Raymond was characteristically quick to recognize, encourage, and attach to his corps of editors, reporters, and correspondents young men of talent and ambition. He realized that he had found a prize in Holley, who speedily became a frequent contributor to the *Times*. I have found 276 articles from his pen, published in that paper, of which about 200 appeared between 1858 and 1863, and the remainder at rarer intervals to 1875, the last being the leading editorial of April 27th, 1875, on the recently appointed United States Testing Board. The range of these articles is indicated by the following classification: Setting aside 52 miscellaneous articles (descriptive, political, etc.), and 30 which may be called "scattering," though devoted to engineering topics, we have 194, divided as follows: Railways (including street railways), 49; steam navigation, 42; war ships and armor, 30; the Stevens battery, 22; arms and ordnance, 19; boiler explosions, 14; and steam engines, 7. The most important and remarkable of these articles were, perhaps, those on the Great Eastern, written under the signature of "Tubal Cain." In 1859, he accompanied Mr. Raymond to Europe as a *Times* correspondent, made the acquaintance of Brunel and Scott Russell, and thoroughly studied the structure and details of the great ship. His description (October,

1859) of the vessel and its machinery (accompanied with drawings), his account of the trial trip, the accidental explosion occurring on that occasion, the coroner's inquest, etc., and his discussion of various engineering and commercial questions thus suggested, present a wonderful combination of technical, critical, and literary skill. The articles attracted attention on both sides of the Atlantic, and the *Times* assumed a position of authority on engineering topics not before or since occupied by a New York daily newspaper.

In 1860, Holley again went to Europe for the *Times*, and returned on the first transatlantic trip of the Great Eastern. This time his equally remarkable letters were divided between the *Times* and the *American Railway Review*, of which in the mean time he had become editor of the mechanical department. The *Review* was a New York weekly. His connection with it began with its second volume, in January, 1860, and lasted about eighteen months. Among the first things he contributed to it was a description and explanation of the Giffard injector, then a novelty. An examination of the columns of this paper and of the *Times* throws an interesting light on the manner in which he contrived to do so much literary and professional work. He made one hand wash the other. The topics treated for the general public in the *Times* were served up in more technical form in the *Review*. The anonymous editor in the *Times* frequently quoted and commented upon the avowed editor of the *Review*, and *vice versa*. But all this was merely the incidental, though necessary, occupation of this period. He wrote to earn money, and he wrote with the rapidity and versatility of a Bohemian; but all the time his eye was upon his profession, and his articles were but the chips thrown off in the labor of preparing his American and European Railway Practice, which appeared at the close of 1860. This was, so far as the subject of permanent way is concerned, a digest of the report of Colburn and Holley, but it was a great deal more. The subjects of the combustion of coal, its use in locomotives, the economical generation of steam, the proper construction of boilers, etc., were thoroughly discussed, and the whole problem was treated with the precision of a judge combined with the earnestness of an advocate. The defects of American railway management in these particulars were exposed with satire and indignation. The book was, in even a higher degree than its predecessor, an epoch-making one. Our railway practice in the branches of which it treats has done little more than follow its guidance, and its recommendations and warnings are not yet out of date.

In the preface to this work, Holley acknowledges assistance received from Mr. J. K. Fisher, well known to New Yorkers as an engineer of talent and an inventor who tried hard—and failed—to introduce steam-carriages on common roads. In the latter experiment, Holley gave him some professional and financial assistance. The money was lost; but out of this, as out of all other experiences of his life, he drew a dividend of added knowledge. I believe he never ceased to consider the steam-carriage and traction engine as technically an accomplished success, and certain eventually to find a wide use in this country. To discuss the causes which have falsified, thus far, that expectation, and have left us apparently more distant than ever from its fulfillment, would be beyond the limits of this occasion. Suffice it to say, that in my judgment, the immense extension of railroads is one of them.

Another matter to which Mr. Fisher had given great attention was that of steam fire-engines. How quickly and thoroughly Holley appreciated this problem may be seen in several of his *Times* articles—notably a long one, published December 10th, 1858. It is a model of clear and epigrammatic statement, abounding in such sentences as these:

"The size of a fire-engine is limited by the size of the men who handle the hose. We can build an engine that will throw a river over a mountain—*who will hold the butt?*" * * * *

"Boilers which can raise steam from cold water in three minutes can do almost any thing else in the next three minutes, if they are not closely watched."

There is ample evidence that the outward rewards of all his labors so far had been mainly in growing reputation, not in money. He was still struggling for a living. In April, 1859, he took out two patents, one for a variable cut-off gear for steam-engines, and the other for railway chairs.

Of the railway-chair patent he writes at the time, "My rail-joint seems to be liked; and I shall doubtless make something out of it." It preserved the continuity of the rail ends by brackets, so attached to the spliced pieces and tension plates that the weight of the wheels of the train on the rail kept the splices tightly in their places, without the aid of plates, nuts, keys, or rivets. It was illustrated in his *Railway Practice*, and in the *Railway Review*. It was tried by one or two roads (I believe with satisfactory results); but it did not come into wide use, partly, as I judge, because reforms in rail-sections and permanent way made the simple fish-plate adequate to all demands. As Holley wrote in the *Review*, "The practical difficulty with the fish-joint is not the form of the fishing-piece, but the form of the rail."

Meanwhile, the pressure of outward necessities continued, but Holley's courage and hope rose to meet it. The denser the medium through which he made his way, the greater his relative buoyancy. In March, 1861, he writes:

"I have an engagement with the publishers of Webster's Unabridged Dictionary, to write a lot of engineering words and definitions, to make some illustrations, and to correct engineering definitions, for a new edition of that work, for which I get my name put in the book, and $200. The former part of the pay will be pretty valuable, and the latter part very timely in these awful days of panic and poverty. I am at work at this as hard as possible, to get it done in time, and to get the money."

A few days later, he writes, referring to the slow sale of his book, and other difficulties:

"These unexpected hard times have certainly and *fairly* interrupted my plans. Under normal circumstances, things would have come out as I expected they would. Therefore, I do not think it bad management, but bad luck, that I am still in an undesirable position. But I am making my expenses as light as possible, and getting what professional work I can to do. I yesterday completed an arrangement with the Camden & Amboy Railroad Company, to alter an engine of theirs to burn coal. I am to be paid eight dollars per day, and to be employed thirty or forty days. Mr. Stevens, the President, has been for some years engaged on a battery for the government, about which you know, of course. He says he shall probably be called on to finish it by this administration, and that he may want to employ me, here and in Europe, for this and other matters. I am also getting some business as an expert, which pays first rate—am writing for the dictionary, and gradually getting the business offered, after which I have so long been seeking. So, on the whole, I do not despair of getting back the money I have been investing for the last ten years in *education*, and of securing something to live on."

Up to this time I find no proof that Holley interested himself specially in politics. He seems rather to have regarded with disgust the manner in which the slavery question, in one form or another, engrossed the attention of Congress, leaving great matters of internal improvement, the regulation of commerce, the safety of travel, the construction and maintenance of public works, to be dealt with by crude and hasty legislation. Thus he writes in the *Times*, May 3d, 1860:

"As the law-makers tread the decks of steamers, they will need no expert to unfold the probable causes of danger. Let them but look and tremble: a single compartment with a wooden shell—heaven only knows how weak and rotten—quivering with each stroke of the engine—between them and death: fires roaring and lamps swinging within the very embrace of seasoned combustibles—boiler-plate of questionable tenacity, straining under undue pressure—fire-pumps and hose, bilge-pumps and life-boats, lashed and stowed away for the voyage like so much cargo or permanent ballast; sailing vessels, without light or signal, bearing down into our very path: should sudden danger overtake us, what are the probabilities of deliverance? The chances are, that there will be a collision—that a hole in any part of the hull will admit the sea to every cranny of the fabric; that the furnace-fires will be quenched before the steam-pumps can be set at work; that the ship will founder before all the boats can be cleared and launched; that all the boats will not hold half the people; that there is no material for rafts; that the vessel will take fire; that the fire will get the advantage before the pumps can be got at work and the hose adjusted; that the deficient means of overcoming danger, and especially the delay in applying the means provided, will give accident and carelessness the winning start of defense and caution.

"Urgent and reasonable as are the demands of the case, it is found practically impossible to meet them fully and fairly with legislative enactments. Sectionalism, State rights, spoils, corruption, selfishness, and the whole catalogue of personal and party motives and influences, menace alike the interests of the white man and the negro—the African traveler and the Red River slave."

Like the vast majority of our citizens, he did not realize the serious and instant peril of the country. As late as March, 1861, after the inauguration of Lincoln, when the government of the Southern Confederacy under Jefferson Davis had been fully organized, Holley became a candidate for the position of U. S. supervising inspector of passenger steamers. The letters forwarded in recommendation of his appointment to the President were subsequently returned, and after his death I found them among his papers. I do not wonder he preserved them. They constitute an astonishing testimonial to the professional standing of a man not yet thirty years old. A host of firms and individuals, including the presidents and engineers of the principal American railways, and the managers of great shops for the construction of steam machinery, bear witness to the extraordinary ability and fitness of Mr. Holley. If I repeat before this audience the names of J. Edgar Thomson, Erastus Corning, John Taylor Johnston, Sam Sloan, Charles Minot, Allan Campbell, S. W. Roberts, Amasa Stone, John C. Cresson, W. H. Clements, David Hoadley, George H. Corliss, J. S. Rogers, M. W. Baldwin, Richard Norris, W. W. Fairbanks, Horatio Allen, Benjamin F. Thurston, Peter Cooper, Abram S. Hewitt, Edward Cooper, J. G. Barnard, William G. Hamilton, Cyrus W. Field, Samuel J. Reeves, Montgomery C. Meigs, to say nothing of college and West Point professors, or editors like Henry J. Raymond, and personal friends of the President and cabinet, I need add nothing to prove the unusual force of these credentials. In a private letter, dated April 3d, 1861, Mr. Holley says:

"I was in Washington the other day, about the inspectorship, but I do not expect to get it. I have as fine a list of engineering names as could be offered; but I have no hard-working New York City political backers, except Mr. Raymond. Another candidate is more of a politician than an engineer, and he will probably get the place. However, I may get it. I shall certainly *not* go and bore the President and departments. If they can't take my papers as evidence, they ought not to take my own statement."

Those who remember him in the brightness of his youthful prime can not but feel that his personal application, adding magnetism to the weight of the professional indorsements he presented, would not have bored even the tired officials at Washington, but would have inspired them with the desire to win for the public service his skill and enthusiasm—would have enabled them to find delight in duty. But it was not thus to be—and so far as we can now discern, what was to be was better.

The letters of those gentlemen I have named, with many others, were subsequently recovered from Washington, and arranged and filed by Mr. Holley. On a blank page at the end, he wrote in his bold hand these significant words: "What came of it? Mr. Holley was not appointed." Yet through all his life he was proud of the indorsement he had thus received; and to-night we may safely say that those who gave it need not be ashamed.

Besides the ordinary fatuity which presides over governmental appointments, and the special pressure of party politics in the case of a new administration, receiving the powers and privileges of federal office for the first time from the hands of its party opponents, there were in this instance peculiar reasons for the apparent neglect of Holley's application. Events were then occurring which might well cause those in power to overlook the inspectorship of steamboats. The attention of all was concentrated, not upon the possible accidents that might occur to vessels navigating the Hudson or the Sound, but upon the events then taking place in the South. The firing upon our flag in Sumter and Baltimore excited to their highest pitch the feelings of the North. Many of you must remember the scenes that transformed the metropolis: the vast meeting at Union Square, with its many platforms and orators, and its surging, shouting multitude of hearers and spectators. What enthusiasm attended the passionate appeal of Mitchel and Baker, as they pledged their lives to the service—pledges redeemed by both, after a few short months, in blood! And what frenzy of applause followed the reply of one of the orators, when, being asked from the crowd, "How about the Seventh Regiment?" he answered, "They have just been heard from by telegraph at Philadelphia. It is proposed that they go by sea to Washington; but *they prefer to march through Baltimore!*"

The sudden change in the sentiments of many who up to that time had hoped for compromise, is well illustrated in the case of Holley. In January, 1861, he had written:

"I suppose we have got to have a war; but it is a pity to fight for what isn't worth fighting for. It seems our duty to have a general convention of the people and let the beggars go."

But the events of the next three months were for him, as for the majority of his Northern countrymen, a rapid political education, and on the 23d of April, 1861, he wrote to Secretary Chase the following letter, substantial duplicates of which were sent to the War and Navy departments also:

"I am an applicant, indorsed by a large number of prominent engineers, for the office of United States Supervising Inspector of Steamers.

"In the present state of affairs, I am anxious to bring such engineering facilities as I may command into the service of the government.

"I have an intimate acquaintance with Mr. Scott Russell and many other English engineers and shipbuilders, having been sent to Europe several times on engineering business.

"If I can do the government any good with reference to the construction or purchase of ships or arms, the construction of batteries, gun-boats, or iron vessels of light draught, the application of armor to ships, etc., I hereby offer my services, *without compensation*, desiring only that my necessary expenses be paid, as I have not the money to pay them.

"I know that I have peculiar facilities for gaining the latest information relative to the construction of iron ships and boats and their engines, without waste of time.

"I refer you to the names appended to my application aforesaid. I am ready at an hour's notice."

On the same sheet, Mr. Raymond added these words: "I know Mr. Holley *intimately*, and KNOW him to be in every respect one of the very best men whose services the government can command."

From another source, I learn that at this time Mr. Holley was ready—as what patriotic young American was not?—to enlist in the Army or Navy, but that a little reflection convinced him of the greater usefulness which lay in his professional skill.

The letter I have quoted was filed at the Treasury department (as the clerical indorsement upon it shows) together with the other papers concerning Mr. Holley's previous application for office. Neither it, nor the similar letters addressed to the Navy and War departments, were ever acknowledged. Probably there was no time in those crowded days for mere politeness and thanks. Probably thousands of other men were tendering their services, even without pay. Morever, experienced administrators know very well that the acceptance of such gratuitous service is in most cases no advantage to the public. Officers under salary, and no others, can be held to strict responsibility. The honorary employés of the state demoralize the rest. They despise red tape, which is, on the whole, essential, however harmfully it may now and then be tangled; and, to speak plainly, no tangle is so mischievous as that produced by a volunteer shuttle, flying lawlessly across the web of a regular system. Railroad engineers know how many trains must be delayed, when some swift "special" demands the track, in spite of the time-table.

Doubtless these calm considerations did not comfort the soul of the ardent young volunteer, conscious of the power he freely offered to his country. There is a touch of bitterness in the words he indorsed upon the papers I have quoted: "What came of it? The letters received no attention. The foregoing application to Secretary Chase was found filed with the application for the Inspectorship, at the Treasury. The End." To which, indeed, History adds, "Not the end, but the beginning."

Both his patriotism and his professional ability found an immediate object in the Stevens battery, and in other plans which Mr. Edwin A. Stevens proposed to the government. That remarkable man and his brother, Robert L. Stevens, were the originators of most of the modern improvements in naval warfare. Their father, Col. John Stevens, built in 1805 a steam-vessel with twin screws—a feature adopted in the Stevens battery, and in the Naugatuck (a vessel presented the U. S. Treasury Department during the war by Edwin A. Stevens), and subsequently employed in the war-ships of England. The armored iron-clad known as the Stevens battery was proposed by the brothers Stevens to the United States government as early as 1841. It was not until 1854 that the work was commenced; and in 1861, twenty years after its suggestion, it was still unfinished, the government having refused for more than eighteen years to do any thing about it. Half a million of public money had been spent upon it; Mr. Stevens had spent $200,000 besides; and he now asked from Congress an appropriation of $500,000 to finish the whole work. The proposal met with unexpected opposition. Holley states the case in a *Times* editorial, August 13th, 1861, as follows:

"Here is an iron screw ship of 6000 tons, made of the best selected material, with as beautiful a model as ever floated, with engines and boilers of a pattern superior to that of most modern steamers, and capable of developing the whole horse-power of the Great Eastern, and a speed of twenty miles an hour—a ship that can turn on her own center in perhaps a minute—outrun any known enemy—fire with her eight guns a heavier broadside than the Warrior—fire three of these guns at a time parallel to the keel—sink to the gun-deck during action, and so leave only her cover, as it were, to be protected by plates—carry 6¾-inch armor, inclined at 30°, and coal enough to cross the Atlantic at ordinary speed—a ship up to the best commercial practice in every important detail, and ahead of the best naval practice in nearly all—and this is the vessel that some of our contemporaries advise the government to abandon as a *failure*, while Congress debates bills for the construction of *modern* iron-clad ships!"

It is impracticable on this occasion to trace the course of the discussions, examinations, reports, negotiations, and intrigues which constitute the subsequent history of the Stevens battery. Holley's work, in connection with it, turned out to be rather literary than technical. Mr. Stevens, whose age and health disinclined him to engage actively in a fight for the privilege of serving his country with his knowledge and experience, left this part largely to Holley, who wrote memorials, arguments, criticisms, editorials, with untiring zeal, bringing to bear science, wit, eloquence, and anger in a manner peculiarly his own. Whatever may be said of Stevens's battery, Holley's battery was unquestionably a powerful one; and so far as words could win the battle, he won it. But the victory cost too much time, and when won, it was fruitless.

The peculiar features of the Hoboken ship have been elsewhere adopted and in turn superseded. The principal effect of this episode upon Holley's career was the attention it caused him to give to the subject of ordnance and armor.

Sent abroad in 1862, by Mr. Stevens, to investigate this subject, he found the facts he needed scattered in official documents, monographs, unpublished records, etc., and speedily his own note book became a more comprehensive and accurate collection of them than any printed book. He obtained his information with some difficulty. I find, for instance, the following letter from his friend, J. Scott Russell, referring to certain ordnance works or experiments of the British government:

"MY DEAR HOLLEY: "Sept. 24, 1862.

"I have applied in the proper quarters, and find that special instructions have been given that *you* are to be refused admittance.

"As you have achieved this distinction, you will, I am sure, have no wish to put yourself in a false position. * * * Yours sincerely,

"J. SCOTT RUSSELL."

On another occasion, Holley desired to study the lines of a new British iron-clad, then in process of construction. One of the contractors, whom he had made (as usual) first an acquaintance and then straightway a friend, said to him, "If you can manage to get into the yard, I will show you all you want to see. But I am powerless to procure admission for you, and I am sure it will be refused if you ask it." It must be admitted that, in spite of the confidence of his friend, Mr. Scott Russell, Holley did, on this occasion, "place himself in a false position;" for he hired a stylish carriage, arranged himself in solitary state with folded arms on the back-seat, gave the necessary instructions to the coachman, and drove straight through the big gate into the yard, acknowledging with a bow the presented arms of the guard, as proudly as any other Lord of the Admiralty. Once inside, he found his friend, and satisfied his curiosity. This story, now published for the first time, is respectfully dedicated to her majesty's government!

We can hardly wonder at the occasional exclusion of Holley from important works at that time. He was certain to send to his own government whatever new facts he observed. On the whole, however, he was treated with liberality, and his note-book became, at the close of 1864, a treatise on Ordnance and Armor.

This work has, perhaps, been overrated. It is in reality a clever piece of book-making, remarkable as showing with what rapidity and accuracy a trained reporter, employing both pen and pencil, can collect and arrange a mass of data. Holley's independent criticisms and suggestions are not made prominent; though, when they occur, they are sensible and timely. The book is simply an attempt on his part to supply the need which he had felt on approaching the subject of ordnance and armor—the need of a summary of the existing state of the art. It was translated into French, and became everywhere a recognized authority—just as a dictionary or a directory is recognized authority, particularly if it is large and thorough, and intelligently arranged, and the only one to be had. It is out of date now. The arts of warfare have made great progress since it appeared; and though it is still indispensable as a record, it is, to me at least, chiefly interesting as a specimen of Holley's method of work; his ability to grasp the leading principles of any mechanical problem; the facility with which he seized the details of an apparatus or an experiment, putting them down for future reference in words or in sketches, as might be most convenient; and the system with which he indexed every thing he had once noted, so that he could at any moment recur to it again without delay.

While he was thus studying ordnance and armor, the columns of the *Times* coruscated with brilliant articles from his pen on these topics, and the bureaus at Washington had frequent reason to regret that his genius was not directly enlisted in their assistance, instead of employing the free lance of destructive criticism.

An interesting and able summary of this subject appeared in the *National Almanac* of 1863, under the title, "Iron-Clad War Vessels;" and the *Atlantic Monthly* of January, 1863, contained an article from his pen on "Iron-Clad Ships and Heavy Ordnance." At the close of this article, he speaks of a more extended work, about to be published by Van Nostrand, of New York, thus showing that at that time Ordnance and Armor was almost completed, though it did not publicly appear for nearly two years.

Before it saw the light, his activity had turned into a new and still more important channel. In May, 1863, he writes:

"It is a matter of regret to me, on many accounts, that I have to go to England again this summer; but this is no pleasure trip, but a trip preparatory, I hope, to something settled. Precisely what I am going for, I am not at liberty to say, except that I am going to get information for Corning, Winslow & Co. about a new manufacture. If I succeed, they are going to establish the business, which will be in nature allied to, but in a business way separate from, their present manufacture. They then wish me to become a partner in the new business, * * * and expect, if I succeed, to spend about $30,000 in establishing the new manufacture."

Imagine starting in the Bessemer business with $30,000!

His mission was successful. The Bessemer patents were purchased, and subsequently combined with the conflicting American patents of Kelly. The works at Troy were built and started in 1865, and enlarged in 1867. From this time on, the career of Holley was substantially the history of the Bessemer manufacture in the United States. In 1867, he built the works at Harrisburg. About a year later, he was recalled to Troy, to rebuild the works there, which had been destroyed by fire. Still later, he planned the works at North Chicago and Joliet, the Edgar Thomson works at Pittsburg, and the Vulcan at St. Louis, besides acting as consulting engineer in the designing of the Cambria, Bethlehem, and Scranton works.

It is not my purpose to describe in detail the improvements he introduced into the Bessemer plant. They have been admirably summarized by Mr. Robert W. Hunt, in his paper (Trans. Am. I. of M. E., Vol. V., p. 201) on the History of the Bessemer Manufacture in America. It is fair to say that they put an entirely new face on the commercial relations of that manufacture, by enormously increasing its productive capacity, and proportionately decreasing its cost. Whoever would appreciate their nature and effect, need do but two things: First, compare the pictures of the Bessemer plant and its arrangement, as given in English text-books and journals of that period, with the plans of American works; secondly, compare the records of foreign works with the records of our own. Mr. Hunt says:

"The result of his thought gave us the present accepted type of American Bessemer plant. He did away with the English deep pit, and raised the vessels so as to get working space under them on the ground floor; he substituted top-supported hydraulic cranes for the more expensive counter-weighted English ones, and put three ingot cranes around the pit instead of two, and thereby obtained greater area of power; he changed the location of the vessel as related to the pit and melting-house; he modified the ladle-crane, and worked all the cranes and vessels from a single point; he substituted cupolas for reverberatory

furnaces; and last, but by no means least, introduced the intermediate or accumulating ladle, which is placed on scales, and thus insures accuracy of operation by rendering possible the weighing of each charge of melted iron, before pouring it into the converter. These points cover the radical features of his innovations. After building such a plant, he began to meet the difficulties of details in manufacture, among the most serious of which was the short duration of the vessel-bottoms, and the time required to cool off the vessels to a point at which it was possible for workmen to enter and make new bottoms. After many experiments, the result was the Holley vessel-bottom, which, either in its form as patented, or in a modification of it as now used in all American works, has rendered possible, as much as any other one thing, the present immense production."

Concerning the increasing productiveness of the American Bessemer plant, it may be said in round numbers that it has been raised from the capacity (per two converters) of about 900 tons per month to more than 10,000 tons for the same period—an exceptional maximum of over 14,000 tons of ingots in a single month having been reached by the Edgar Thomson works. Holley's arrangement of buildings and machinery, to secure convenience in handling materials, and his movable converter-bottom and other devices, to reduce the time lost in repairs, were undoubtedly the basis of this great advance, though valuable contributions have been made by the able engineers who followed his lead.

But turning for a moment from technical details, I can not forbear quoting from an article written by Holley, in 1865, for the Troy *Daily Times*, the description of a Bessemer "blow" at night. It is not only admirable in itself, but interesting as a proof of his keen perception of the picturesque and artistic elements in his profession:

"The cavernous room is dark, the air sulphurous, he sounds of suppressed power are melancholy and deep. Half-revealed monsters with piercing eyes crouch in the corners, spectral shapes ever flit about the wall, and lurid beams of light anon flash in your face as some remorseless beast opens its red-hot jaws for its iron ration. Then the melter thrusts a spear between the joints of its armor, and a glistening, yellow stream spurts out for a moment, and then all is dark once more. Again and again he stabs it, till six tons of its hot and smoking blood fill a great caldron to the brim. Then the foreman shouts to a thirty-foot giant in the corner, who straightway stretches out his iron arm and gently lifts the caldron away up into the air and turns out the yellow blood in a hissing, sparkling stream, which dives into the white-hot jaws of another monster—a monster as big as an elephant, with a head like a frog, and scaly hide. The foreman shouts again, at which up rises the monster on its haunches, growling and snorting sparks and flame.

"What a conflict of the elements is going on in that vast laboratory! A million balls of melted iron, tearing away from the liquid mass, surging from side to side, and plunging down again, only to be blown out more hot and angry than before—column upon column of air, squeezed solid like rods of glass by the power of five hundred horses, piercing and shattering the iron at every point, chasing it up and down, robbing it of its treasures only to be itself decomposed, and hurled out into the night in roaring blaze.

"As the combustion progresses, the surging mass within grows hotter, throwing out splashes of liquid slag; and the discharge from its mouth changes from sparks and streaks of red and yellow gas to thick, full, white, howling, dazzling flame. But such battles can not last long. In a quarter of an hour, the iron is stripped of every combustible alloy, and bangs out the white flag. The converter is then turned upon its side, the blast shut off, and the recarburizer run in. Then for a moment the war of the elements rages again; the mass boils and flames with higher intensity, and with a rapidity of chemical reaction, sometimes throwing it violently out of the converter-mouth; then all is quiet, and the product is steel—liquid, milky steel, that pours out into the ladle from under its roof of slag, smooth, shining, and almost transparent."

It is scarcely possible to exaggerate the importance, to this country and to the world, of the Bessemer manufacture, and particularly of that manufacture on the vast scale which Holley's improvements helped it to assume. The end is not yet. The structural uses of steel are still in their infancy. But in one branch of engineering—the branch of Holley's early choice and love—a world-shaking revolution has been accomplished. The permanent way of which he wrote so much has received its final perfecting touch in the steel rail—and cheap transportation has been the result. The farmers and cattle-breeders of Great Britain find themselves brought into competition with regions of the very existence of which they had scarcely heard before. The invention of an English chemist, perfected and applied in America, reacts upon the whole social fabric. The gigantic specter of the land question itself reveals through its dread garments a skeleton of Bessemer steel!

To Holley personally, the entrance upon these new labors was the greatest change of his life. His chance, for which he had so patiently waited and so thoroughly prepared himself, had come at last. His work changed from the critical to the creative; and a whole side of his genius, repressed hitherto, sprang into joyous power.

All his life he had been fond of designing. The fertility of his imagination and his artistic taste were shown in a thousand ways—in the drawings with which he adorned albums and scrap-books; in the design he made for the charter-oak chair of state, which still wins admiration in the capitol of Connecticut; in his love of old cathedrals and masterpieces of painting and sculpture. But he was not bewitched by the surface of beauty alone. Looking below the surface, he recognized the beauty of adaptation. He recognized the great scientific truth that the line of economy is the line of grace. The arch, the truss, were no unmeaning forms to him. And beneath a strong, light roof, or before a well-designed machine, or in the midst of a well-arranged plant, he found the satisfaction of an artist as well as an engineer. I think he took more pride in the Edgar Thomson works than in any other which he helped to build, because, as he once said to me, he began at the beginning with them, taking a clean sheet of paper, drawing on it first the railway-tracks, and then placing the buildings and the contents of each building with prime regard to the facile handling of material: so that the whole became a body, shaped by its bones and muscles, rather than a box, into which bones and muscles had to be packed.

Yet this new activity was not substituted for the older ones; it was rather superadded to them. In January, 1869, he took charge of Van Nostrand's *Eclectic Engineering Magazine*, which he edited for a year. In August of that year, he wrote from Troy:

"I have not got along far enough in life to look back on much work or much fruit from it; but I have lived long enough to conclude with certainty, that leisure is the hardest thing in life to get along with. I try to have as little of it as possible."

In the subject of technical education, as I need not tell the members of these societies, he was deeply interested. Elected in 1865 a member of the Board of Trustees of the Rensselaer Polytechnic Institute, he made his influence felt in favor of an improved curriculum, keeping pace with the demands of the times. While it is impossible to discuss at this time the views on technical education which he subsequently announced, it is worth mention, in passing, that the system he so eloquently advocated, of a practical training preceding the scientific instruction, was not the one under which his own genius had developed itself. He went from the school to the shop, not from the shop to the school.

If I pass swiftly over the latest and most fruitful years of his life, it is not because I fail to recognize their importance. They were in every way his best working years. His rapidly growing fame, his widening circle of friends, his own matured power, combined to give value to his labors and to win for them adequate reward. In fact, this is the answer to those impetuous ones who think it better, as they say, "to wear out than to rust out," and declare that if they do twice as much, and only live half as long, the world at least will be no loser. This is not true. A true man's last work is his best. Two bushels of green apples to-day are not the adequate substitute for one bushel of ripe ones, when Time shall have brought them to perfection. And this ripening effect of Time is in human character the one thing that can not be hurried. Wisdom—the degree conferred upon faithful students in the University of Life, can not be had in the sophomore year.

But the work of these wisest and intellectually strongest years of Holley's life is, for the most part, either familiarly known to all of you, or it is still under the lock and key of his professional relations, in confidential reports. His papers and addresses in the Institute of Mining Engineers, of which he became a member in 1872 and President in 1875, the Society of Civil Engineers, of which he was a Vice-President in 1876, the Society of Mechanical Engineers, of which, together with the honored chairman of this meeting he was a founder, and the British Iron and Steel Institute, and Institution of Civil Engineers, of which he was a member; the admirable paper on Iron and Steel, contributed by him to the Reports of the Judges of the Centennial Exposition in 1876; the series of illustrated articles on American iron and steel-works, prepared by him together with Mr. Lenox Smith for London *Engineering*, from 1877 to 1880; his masterly treatise on steel, published in 1880 in Appleton's Cyclopædia of Mechanics; and, in another sphere, his breezy description in *Scribner's Monthly* for May, 1878, under the title "Camps and Tramps about Ktaadin," of a health-giving summer excursion, in genial artist company, to the forests and mountains of Maine—these are both familiar and accessible to you all. But more voluminous, and in many respects still more valuable, were the reports which he printed and issued confidentially to his clients (for the last five years to the members of the Bessemer Association only) on the various branches of steel manufacture. No doubt, when the immediate business value of these reports shall have passed away, they will become accessible to engineers generally; and they will be found a mine of clear, precise, well-arranged, and well-discussed information. I know that he regarded them as his best work, and that he put his life into them.

Of all the later labors to which I have alluded, and of other works of his pen, I shall publish as an appendix to this address a catalogue.* which I believe is complete and which in itself constitutes a striking picture of his intense and various industry.

It was probably about 1875 that his elastic strength began to fail. In that year he wrote: "I have been so hard at work for so long that I am getting pretty tired and 'played out.' I am going in a week to one of the Elizabeth Islands, off New Bedford, where there is neither mail nor telegraph, to lie on the sea-shore for a week and try to get strong and *sleepy*." That last word tells the story.

In June, 1875, he was appointed a member of the United States Board for Testing Structural Materials. He had been unwearied in active in promoting the formation of this Board; he was not the least laborious of its members; and down to the end of his life, he ceased not to strive that its work, so promising, so fruitful, so unfortunately interrupted, should be revived and continued. In our endeavors to advance that great work against ignorance, indolence, and prejudice in quarters high and low, we shall sorely miss henceforward his voice and pen.

In 1879, he accepted an appointment to lecture at the School of Mines, Columbia College, on the manufacture of iron and steel. He wrote these lectures with great care, printed a complete synopsis of them for the use of the students, and took as much pains to assure himself of the proficiency of his class, by rigorous examinations, as if he had been a resident professor, and this his chief business.

Besides the two early patents which I have already mentioned, Mr. Holley obtained fourteen others. Ten of these refer to his improvements in the Bessemer process and plant; two of them to roll-trains and their feed-tables; and the remaining two are those of July 18th, 1876, and March 1st, 1881, the first for a water-cooled furnace roof, and the latter for a steam-boiler furnace, with gaseous fuel. These are both important; and the first of them, in which the pipes cooling the arch of a furnace constitute at the same time the skeleton supporting it, is highly ingenious in conception and detail. It is not unlikely to be the "furnace of the future" for many purposes. The last of his Bessemer patents (purchased since his death by the Bessemer Association), that of the detachable converter-shell (April 26th, 1881), is perhaps the most important of all, after the old converter-bottom patented August 9th, 1870. I will not describe it here. It is discussed by its inventor in a manner to leave nothing more to be said, in a paper read in November, 1880, before the American Society of Mechanical Engineers.

It is pleasant to remember that in these later years he began to receive the public and professional recognition which his genius and perseverance deserved. In 1878, on the twenty-fifth anniversary of his graduation, his Alma Mater bestowed on him the honorary degree of Doctor of Laws. A still more appropriate honor, the Bessemer medal, given in cordial though late appreciation of his services and merits, can be placed, not, alas! in his hand, but only on his tomb. But these things are but trivial symbols of the warm, unanimous, universal love and respect with which he was regarded by the engineers of two worlds.

This has been more adequately shown by the outburst of sorrow and of eulogy on both sides of the Atlantic, which followed his death. Yet scarcely less significant was the cordial welcome which, while he yet lived and labored, awaited him everywhere on his journey. All doors—

* This catalogue will be published in the "Memorial Volume."

even those which were inscribed with "No admittance"—opened before him. One of his friends who has been traveling this year among foreign iron and steel-works, writes that Holley's name has been everywhere a potent charm, securing for him an eager courtesy of reception.

I have resolved to make this address, as far as may be, purely professional and critical; and there has been no lack of testimony to Holley's private virtues and personal magnetism, so that I need not dwell at length upon these. But even in a cold estimate of his professional achievements, these qualities can not be passed over. Generosity, honor, tact, unselfish interest in the welfare of others, high devotion to great causes, unstinted service to the interest of employers, a full performance—nay, an overflowing performance—of every duty: these qualities win love and trust; and to win love and trust, in our profession, as in every other, is the very heart of success.

We may answer now the questions with which we began. This life *was* successful. It was filled with the joy of labor; it was surrounded at the last with comfort and fame and troops of friends. But the success was not of accident, or luck, or sudden growth. It was earned, inch by inch; won out of innumerable delays and defeats; held at the cost of constant vigilance and toil. Homer sings of warriors who were invulnerable and irresistible; but Homer gives them the assistance of the gods, fighting invisibly beside them; and to my mind, his noblest heroes are those who stand up bravely against such odds, and die where they stand. Again, the tales of chivalry are full of triumphant champions, whose lances in *melée* or tourney nothing can resist. But history tells us that, apart from the exaggerations of the legend, these all conquering heroes were arrant humbugs—princes, whose prowess it was the part of courtiers to help them to exhibit; that their invariable triumph was the farce of hired players. *Our* hero was no such gay cavalier. Neither miracle nor connivance made his lance omnipotent. His armor was bruised and dented in earnest; he knew the shock, the overthrow, the retreat, the struggle again and again renewed, the victory that called for new conflicts with new risk of defeat.

If Holley's genius was such as to forbid us from hoping by mere effort to attain equal hights, yet, on the other hand, there is ample encouragement and instruction in his career for all young engineers. Let me, in closing, barely mention its chief lessons.

The first is the great benefit of uniting theory and practice. It is less important how these are to be combined than that the student of either should not despise the other. Every word that Holley spoke, every line he wrote, betrayed his familiarity with the practical operations, tools, difficulties, and needs of his business. A great inventor once said to me (when I talked to him of some fancied discovery of my own): "My boy, half the art of invention consists in knowing what needs to be invented." Holley's career illustrates this principle, and bears witness also how deeply he felt what he called the inadequate union of engineering science and art, and how ardently he labored to make it closer and more complete. Not his eloquent words merely, but the eloquence of his whole life speaks one language—the language of the brotherhood of brain-workers and hand-workers. And what he was, even more than what he said or did to promote such union, wrought mightily to that great end. For the end is to be found in the multiplication of such men as he—men who do not merely preach harmony to the two classes, but actually belong to both.

It is important to observe that the foundation of his training was wholly American. Far be it from me to disparage the advantages of foreign study. I would not speak such treason to my own alma mater in a far land. But I say without hesitation, that he brings most from travel and study abroad who carries most to them. Many a precious graft they have furnished, and will yet furnish, to our native stock; but the stock is as important as the shoot, and there are too many young men returning with their hands full of scions and nothing to graft them on. How illustriously different was Holley's career!

Another important matter is the early cultivation of the observing powers, and, as incidental thereto, the art of drawing. Holley's facility in these respects was an inestimable advantage to him. He inclined to graphic methods of stating and solving engineering problems; and his eye, thus trained, became an intuitive judge and calculator.

Then comes, in natural succession, the habit of instant, rapid, accurate, methodical recording of observations. It was Holley's practice to do this constantly; to make every record so clear and complete that it could be comprehended and used after years had passed; and to index his note-books and scrap-books so that they became thoroughly available at any moment. This is no trifling matter. When the officers of our Corps of Engineers are examined as to their fitness for promotion, they are obliged not only to answer questions and prepare "projects," but also to exhibit the note-books they have kept during their terms of service. No other revelation of character is more significant, no test more severe. The work that a man does in a hurry, and unobserved, and for himself, not the public, tells the story of his method and temperament. Holley's note-books are models of fullness and order.

But neither observing, nor recording, nor studying, nor the combination of all these with practical training, completely furnish the engineer for the highest place. For he has to deal, not merely with matter and mathematics, but also with men. They must be made to recognize his skill, to back his enterprise, to co-operate in his achievements. Influence, *influence*—that is the secret of power. Genius may seize opportunities; influence brings them. And the chief vehicle of influence is language. The mastery of language, therefore, is no superfluous accomplishment to the engineer. The young man who deliberately and of choice says, "I mean to be scientific, but not 'literary;'" or the parent who says, "My boy is not going to need a liberal culture; he is going to be an engineer," is ignorant of the most potent principle of modern life—the solidarity of the race, the dependence of each upon all, the necessity of a wide foundation for a high fame, the universal law that every occupation deals ultimately with men even more than with things, and that the ability to shape things is almost barren without the power to move men.

But language, as the means of this power, is effective in proportion as it is filled with appeals to the responsive associations of human minds. A host of things in fancy, poetry, history, and general literature, concerning which people are interested, may be trivial in themselves: it is nevertheless worth while to know them and to use them, as a means of commanding the interest and assent of men. In other words, a wide culture, in sympathy with the age in which we live, is an element of power. It is true that all this, belonging to the art of expression, is wasted in the hands of him who has nothing to express. Men may be arrested to listen, but they will soon find out that behind the skillful utterance there is neither character nor knowledge. They may be fascinated by the instrument, until they find out there is nothing in the tune. But when real genius and noble ambition utter themselves through the channels of art in language, how gladly hears the world!

Holley's versatility and intellectual sympathy with many lines of thought prevented him from sinking to the level of drudgery, though he worked harder than many a drudge; they made him, not merely a bricklayer, but an architect for his generation. Controlled and reinforced by a mighty perseverance, softened and brightened by an unfailing gentleness of soul, they added to his genius that which made him great. For what we call greatness in any sphere is simply *recognized excellence*. The excellence may be spurious, the recognition may be factitious and ephemeral—then the greatness is false, and the great of to-day are forgotten to-morrow. But when a noble character has been nobly exhibited; when genuine power has won genuine praise; when fame soars not for a brief flight into the windy air, but stands firm-footed on the solid pyramid of achievement, to sound through her silver trump the name of her victorious son—conqueror of nature, leader of men—this greatness will endure.

Build him a monument that shall testify our love and his renown. Let the world understand that not alone the plots of politics or the luck of war may give title to such public memorials. This witness, addressing as it does the imagination, the ambition, the worthy pride of the greatest number of men, is conspicuously appropriate to a life so many-sided and complete, so simple and sincere, yet so popular and influential.

He did not, as once he feared he might, go down poor and unknown, carrying with him thoughts of which the world was not worthy. He was heard, believed, accepted, rewarded—with no greater delay or difficulty than sufficed to bring out to their full extent his own best powers. It was given to him to do grand things in the sight of all men. And beneath all our words and pictures and statues of him—lies forever, a sure foundation, the work that he did for his time.

Foresters tell us that a tree once marked will retain the mark, though a hundred years of growth may have overlaid it with later coverings. What may be the future spread and stature of the stately oak of American engineering we can not presume to foretell. But there will come no time when the historian, stripping off the rugged bark, and cutting through the rings of many generations, will not find at the heart that name which with keen blade and skillful hand was carved by Alexander Lyman Holley!

GENERAL MINING NEWS.

ARIZONA.

The Sultana mine, near Randolph, has been bonded to Chicago parties for $23,000.

COCHISE COUNTY.

COPPER QUEEN.—A road is building by this company from Bisbee through Mule Pass, which will shorten the distance for transportation twenty miles.

PIMA COUNTY.

A new and important strike in the Atascaso Mountains, a range comparatively unknown and lying about twelve miles west of Tubac, has been reported by the *Citizen*. The ore is copper glance, apparently of great richness, carrying about seventy per cent of copper, together with paying quantities of silver. From a ten-foot hole, the only work yet done, some six tons of ore have been taken. The property embraces seven claims, which are easy of access and abundantly supplied with wood and water.

TOMBSTONE DISTRICT.

Recent dispatches state that the mill at Dos Cabezas will start up on good ore from the First Chance mine, in that district, in a few days. The Randolph, Blue Jacket, and Little Devil mines show an improvement in quality and quantity of ore. Until the new pumps have been put in the Contention mine, a reduced force of miners will be at work. A drift has been started at the Grand Central 300 level, to connect with the Naumkeag shaft. Water has been struck in the winze in Fair Villa. The Girard mill started up November 1st, on Ingersoll ore. The Sidney drift from the 200 level has been connected with the Grand Central. There is a continuous ore-vein in the drift. The Tombstone Mill and Mining Company is working the Good Enough mine more extensively than any of its other mines. A 2000-foot tunnel has been started through Military Hill on the Big Pedro and Little Pedro mines.

CALIFORNIA.

BALTIC.—It is expected that the mill will be running about the middle of November.

THE BODIE DISTRICT.

BODIE.—During the past week, 159 tons of ore were extracted. Average assay value of ore, $96 per ton. An improvement is reported in the 730 level.

STANDARD.—The superintendent reports that 436 tons of ore were extracted; crude bullion received, 4795 ounces. No change to report in the lower levels, but the south stope, 385 level, shows marked improvement in width and quality of ore.

COLORADO.

GUNNISON MINING, MILLING, AND SMELTING COMPANY.—At the annual meeting held at Denver, October 23d, the following-named gentlemen were elected for the ensuing year: Frederick Krueger, President; John Strahley, Vice-President; A. A. Van Wagener, Secretary; Frederick Krueger, Treasurer; M. H. Streit, Superintendent.

ARAPAHOE COUNTY.

The new Grant smelting-works, at Denver, are rapidly getting under full headway. Six furnaces are already in blast, and the remaining two will be blown in within a few days, when the works will be in full operation. All the latest and best improvements in smelting machinery have been introduced.

CHAFFEE COUNTY.

MADONNA.—The furnace was started July 5th, and has treated about 2000 tons of ore, which produced nearly $80,000. This entire yield is from the Smith & Grey mine, now owned by the company.

CLEAR CREEK COUNTY.

FREELAND.—The report for the week ended October 23d says that the south drift, Freeland lead, has been run 23 feet, and shows a soft streak of low grade mineral. The north drift, first station, was run 26 feet, and is now in 154 feet from shaft, with a good breast of ore. The south drift was run 29 feet (total 154

feet), and has a streak of fair concentrating ore. The stopes are looking exceedingly well. Our assays are higher daily, the mill producing about 20 tons per day, which are delivered to the Dumont smelter.

KOHINOOR.—At a meeting of this company, held recently at its office, Union Court, Old Court street, London, England, the name was changed to that of the Donaldson Mining Company (Limited).

MIDAS MINING, MILLING, AND REDUCTION COMPANY.—Some ore of the Sterling lode recently sold to the smelters contained 3·10 ounces gold, 14 ounces silver, and 22 per cent lead per ton. It came from a depth of 40 feet.

DOLORES COUNTY.

The Grand View smelter has blown in, to run all winter.

The Puzzle extension mine has been sold to Cincinnati parties for $50,000.

GILPIN COUNTY.

HIDDEN TREASURE.—Forty stamps are run of the fifty-stamp mill, fifteen of which are employed on ore from the California mine on Quartz Hill, and twenty-five on company ore from the Hidden Treasure west of the California.

LAKE COUNTY.

From late Leadville exchanges, we take the following:

The Leadville Ore Concentrating Company has recently been incorporated by J. W. Marden, Charles F. Cuno, T. T. McManus, and William C. Foster. Several large contracts have already been secured by the company, and while for the present the ordinary hand-jigs will be used, it is the intention to experiment, and as soon as a mill can be found that will do the work properly and economically, it will be secured and erected.

ÆTNA.—The ore-body developed in the north shaft has now been followed westward for some distance. While first encountered at a depth of about 24 feet, it rose to within 18 feet of the surface. A new shaft has been sunk at this point. A drift is also running north from the cross-cut drift from the No. 5 shaft, to connect with the new workings. The mine is making occasional shipments of high-grade ore, but work is principally confined to the development of the new ore-body.

BROOKLAND.—Work has been resumed. The shaft was closed down for the reason that its pumps were compelled to handle alone all the water in that portion of the hill. An arrangement has now been made with the adjoining Clontarf, by which the latter agrees to work with the Brookland, and it is expected that, with the pumps of both mines working at the same time, the water can be controlled.

CARBONATE.—One of the largest new resources of the mine is disclosed in the tenth level south, which has been extended for a distance of 400 feet, showing mineral extending in new and hitherto unprospected ground. The eleventh level north also shows large resources. Near the outcrop of the vein, a large pot-hole in the lime has been opened, 20 to 30 feet below the line of contact, showing 7 feet of ore running 73 ounces in silver.

CHRYSOLITE.—The concentration-works are now in shape for running. The results of the ore run through thus far are sufficiently satisfactory, although, owing to the fact that much of the time has been consumed in perfecting the plant, no definite data of the results attained have been obtained. A run will be made shortly on a lot of 20 tons, which will enable a more thorough and accurate test to be made of the actual degree of concentration arrived at.

EVENING STAR AND MORNING STAR.—Both mines are shipping more extensively than they were some weeks ago, the average daily output being 85 or 90 tons each. Development and exploration-work in the lower territories continue. In the extreme eastern or upper working, the results are also gratifying and indicative of still greater results with the attainment of greater depth.

HOPKIN.—The suit for the possession of this mine, on Mount Sheridan, was decided, October 26th, in favor of the plaintiff, and the sheriff will take possession and turn it over in accordance with the order of the court.

SUMMIT COUNTY.

ROBINSON.—The old smelter dump has been sold and shipped to the La Plata works, at Leadville.

DAKOTA.

FATHER DE SMET.—The superintendent reports officially for the week ended October 22d, that 1950 tons of ore were extracted and milled. West tramway level rise advanced 17 feet. Rise, up 60 feet, completed. Justice drift advanced 8 feet. Drift in, 144½ feet.

GEORGIA.

CONSOLIDATED GOLD MINING COMPANY.—The *Mountain Signal* says that the cut in the Bost mine shows good ore, work is going on at both ends. At the Ivey, there has been but little change in the activity of the mine as far as milling and mining are concerned, though extensive improvements are making on the property in the way of ditch-cutting.

GOLDSMITH GOLD MINING COMPANY.—The Keystone property has been purchased by this company. Work has begun, and as soon as a mill can be erected, operations on the quartz leads will begin.

IDAHO.

The following figures, says the *Times*, may be accepted as a reasonable estimate of the value of the shipment from the mines of the Bullion camp: The Mayflower, $150,000; Idahoan, $150,000; Jay Gould, $150,000; Bullion, $100,000; O. K., $50,000; other mines, $100,000. The yield would have been twice as large if the transportation could have been secured.

The smelters of the Wood River country have been doing a heavy business. The Philadelphia has 100 tons of bullion on its platforms. The Muldoon smelters, with a capacity of 80 tons daily, are so near the mines of the same company that a tramway carries the ore from the dump to the ore-bins, and while one car descends with ore another returns with timbers. It is the intention to run all winter.

The Ophir group of mines, located near the head of Quigley Gulch, five miles east of Hailey, have been sold to a Chicago company, which will begin developments next summer. The property consists of four locations, all of which show high-grade galena.

NEVADA.

ALBION.—The furnaces are nearly completed; they are situated about 100 feet south from the shaft, and a track is laid in order to take the ore off the cage and run it into the furnaces. A little to the west of the furnaces is a charcoal bin which holds 100,000 bushels of coal, and a road is graded on a level from the top of the furnaces to the chutes from which the coal is discharged. There are about 100 men at work on the surface.

DAY SILVER MINING COMPANY.—The report submitted at the annual meeting shows that the total product of the furnace for the year, including September 12th, was 4174 bars, valued at $120,362.62. The total product for the year, including silver, gold, lead, and copper, $236,357. The secretary's report shows the receipts and disbursements of the company for the fiscal year ended September 19th as follows: Receipts, $338,353.19; disbursements, $258,353.16. The actual indebtedness of the company September 19th, $31,247.76.

EUREKA CONSOLIDATED.—Accumulation of gas in the shaft exploded October 30th with a tremendous noise, heard miles away. The shaft is shattered from top to bottom for seventy-five feet. The explosion tore away the eastern side of the works. The eastern portion of the company's new large works was demolished, and an immense roof crushed in. No lives were lost. Damage, $25,000.

INDEPENDENCE.—A letter dated October 20th says: Ore milled the past week averaged $503 per ton. Stopes through the mine are producing the usual quantity and quality of ore. It will require another week to finish repairing and timbering the west cross-cut 300 level before we can resume work in the face. Regular bullion shipments will be made each week from now on.

RUBY HILL TUNNEL COMPANY.—Work is vigorously prosecuted at the tunnel, near the Prospect Mountain Tunnel. This company was recently organized to work a number of mining properties on Prospect Mountain.

THE COMSTOCK LODE.

Telegraph dispatches state that the connection of the north and south drifts in the Sierra Nevada mine opens up 1000 feet of new ground. Cross-cuts will be run at intervals the whole length. In Mexican, the northwest drift on the 2900 level is running to meet the south drift of Union Consolidated on the same level. This connection will open to exploration all the ground from Union Consolidated to California, some 2000 feet. These operations, it is thought, will increase speculation. A cross-cut has been started on the 2700 level, 500 feet north of the Sierra Union joint-winze.

NEW MEXICO.

A company has recently been organized at Silver City for the purpose of erecting works for the reduction of ores from the mines of the neighborhood. Work has already been begun upon the mill-site of the Massachusetts & New Mexico Consolidated Mining Company, which has been leased by the new company for a long term of years.

A company called the First Mexico Coal Oil Company is organizing to develop the new petroleum discoveries in Bernalillo County, ten miles north of Fort Wingate.

Recent reports state that the Sierra Grande Mining Company will immediately erect a smelter near the property at Lake Valley.

MONERO COAL AND COKE COMPANY.—The treasurer of the company states that the output of the company's coal mines for the month of October was 2087 tons

UTAH.

HORN-SILVER.—According to an official statement, for the nine months ended September 30th, issued by W. F. Van Pelt, treasurer, 35,661 tons of ore were smelted, yielding 11,804 tons of lead and 1,255,111 ounces of silver, having a value, at $90 per ton for the lead and $1.09 per ounce for the silver, of $2,420,401.33. The actual receipts for the first nine months of the year were $62,078.06 for ores, $994,728.88 for lead, and $1,526,958.80 for silver, making a total of $2,538,765.74. The operating expenses were $1,388,047.92. During the same period, the dividends amounted to $900,000.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Nov. 3.

The mining market has been more active this week than for some time past, and the dealings have extended more generally over a number of stocks. The Comstock shares came in for a good share of the business, and were both active and strong. Of course, Robinson, Decatur, South Pacific, Silver Cliff, and others of like nature claim most of the transactions; but the manipulators are finding it hard, up-hill work to keep the price of these stocks strong, and consequently the dealings in them are gradually falling off. The market closed firm. The sales of mining shares at all the Exchanges aggregate 608,954 shares, as against 554,686 last week.

The Comstock shares have shown some activity at stronger prices. California had a fair business, and was strong, selling from 27@33c. Consolidated Virginia was active and strong at 69@86@78c., with sales of 12,700 shares. Sierra Nevada was moderately active at irregular prices, selling at $6⅝@$7⅛@$7. Union Consolidated was very quiet at strong prices, selling at $5@$6⅝. Mexican had a moderate business at stronger prices, and sold at $4¼@$5¼. Ophir was quiet and strong, selling at $8.25@$4. Consolidated Imperial sold at 7@6c., with a quiet business. Best & Belcher records sales of 350 shares at $5.50@$6.25. Sutro Tunnel was active and steady, selling from 25@33@30c.

The Leadville stocks were active at steady prices. Amie was active and a little weak, selling at 12@10@11c. Chrysolite was moderately active and strong, selling from $1.30@$1.60@$1.45, with a business of 9345 shares. Hibernia was quiet and weak at 4@2@3c. Iron Silver had a small business at steady prices, selling at $2.20@$2.30. Leadville was quiet and strong at 60@71@70c. Little Chief sold to the extent of 1400 shares at 51@49@50c. Little Pittsburg was quiet and steady at 80@$1@95c. Climax sold from 4@6c., with a business of 6400 shares. Miner Boy was very active at steady prices, selling from 3@6c.

The Bodie stocks were very quiet at steady prices. Bodie sold to the extent of 1120 shares at $3.50@$3.65. Bulwer was quiet and steady, selling at $1.15@$1.25. Standard was very quiet at steady prices, selling at $6@$6.13.

The Tuscarora stocks were quiet and steady. Tuscarora sold at 7@9c., with a moderate business. Argenta, with one small transaction, sold at 40c. Independence was quiet and irregular, selling at 87c.@$1@90c., with a business of 2200 shares. Navajo was quiet and steady at $5.25@$5.63.

In the miscellaneous list, Eureka Consolidated shows a little strength, under a moderately active business; it sold from $12@$10¾@$12¼. The Green Mountain stocks have been fairly active at steady prices. Green Mountain was strong, selling from 50@63@60c. Rising Sun was active and steady at 5@6c., and Cherokee was quiet and steady at 18@16c. Hall-Anderson was quiet and steady, selling at $2.30@$2@$2.10. Robinson Consolidated shows signs of weakness under a very large business; it sold from $1.70@$1.40@$1.45, with transactions of 108,650 shares. Alta-Montana has been active and about steady at 20@16c. Bradshaw, with a fair business, has been steady, selling at 35@40@39c. Caledonia (B. H.) records sales of 1700 shares at $2@$1.75. Central Arizona has been quiet and steady at 60@55c. Decatur continues to be very active, but has suffered a slight decline in price; it sold from 72@60c., with a business of 21,800 shares. Durango was quiet and steady at 8@9c. Oriental & Miller has been very active, and shows some strength, selling from 13@19@17c. Silver Cliff has been active and irregular at 91@83@85c. South Hite, new, was dealt in to the extent of 1800 shares at 30@32c. South Pacific has been very actively dealt in at steady prices; it sold from 14@10@13c. The State Line stocks have been active and a little stronger. Nos. 1 and 4 sold from 5@6c., and Nos. 2 and 3 from 13@18@16c. Taylor-Plumas has been active and steady at 13@15@14c.

At the meeting of the Chrysolite Mining Company, the officers of the company were re-elected. According to the annual report, there were driven during the

year 13,499 linear feet of timbered drifts, 1413 feet winzes and rises, and 99 feet of shafts; 10,774 tons of ore sold netted $401,816.89, or $37.29 per ton. The total expenditure at Leadville was $397,751.60, or $36.63 per ton of ore shipped. Per foot of lineal drift, etc., the expense was $26.49, against $32.08 during the previous year. A much larger amount of dead-work was therefore done, while on the other hand the quantity and grade of the ore were lower, and were made more expensive by the necessity of careful hand-sorting. The cash surplus on October 8th, after the payment of the September expenses was, at New York, $215,694; and at Leadville, $4,339; a total of $220,034. The surplus on October 8th, 1881, was $490,056, from which $300,000 were paid in dividends. The operations of the year from October 8th, 1881, to October 8th, 1882, therefore resulted in a profit of only $29,978, to which may be added $6000 paid in settlement of the $15,000 "unsettled claims" reported last year, and $2500 paid for property, making $38,478 profit, apart from the money spent on new machinery and permanent improvements. We shall be in a position to give fuller particulars from the forthcoming report. We understand that the Brunswick gold mine, Nova Scotia, has been purchased by a number of gentlemen, among whom General Crittenden, Senator Adams, and others are mentioned.

A special meeting of the Directors of the Robinson Consolidated Mining Company was held last Wednesday afternoon, at their office in William street, for the purpose of considering the advisability of the payment of a dividend; but it was thought to be inexpedient to do so at the present time. The officers of the company report about $45,000 cash on hand in this city.

It is understood that the Lake Valley stocks are soon to be listed at the New York Exchange. Messrs. Watson & Gibson, of this city, quote to-day Sierra Grande, $4.25@$4.50; Sierra Bella, $1@$1.15; and Sierra Apache, 72@80c.

REVIEW OF THE SAN FRANCISCO MARKET.

The largest part of the transactions in the San Francisco market have been in the north end Comstock shares, which have been strong, with a decidedly upward tendency. The other stocks have been quiet and steady. Navajo has declared a dividend, and will have a balance on hand of $55,000, after paying it.

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS.					
	Oct. 27.	Oct. 28.	Oct. 30.	Oct. 31.	Nov. 1.	Nov. 2.
Alpha	1¼	.....	.....	1⅜	1⅜	.....
Alta	9-16	.....	½	9-16	½	½
Bechtel	*	.....	1-16	1-16	.....	1-16
Belcher	1	29-32	29-32	29-32	15-16	27-32
Best & Belcher	6	5¾	5¾	6⅜	6⅜	5⅞
Bodie	3¼	3⅜	3¼	3⅜	3⅜	4
Bullion	¼	¼	3-16	¼	.....	3-16
Bulwer	.....	.....	.....	1½	.....	.....
California	5-16	5-16	¼	5-16	5-16	¼
Challar	1⅜	1⅜	1½	1⅝	1⅝	1⅝
Con. Virginia	11-16	¾	11-16	¾	13-16	¾
Crown Point	1¾	1⅝	1⅝	1⅝	1⅝	1⅝
Eureka Con	11	11¾	10	11	.....	12
Exchequer	11-32	5-16	11-32	13-32	13-32	11-32
Gould & Curry	3	3	3¼	3½	3¾	3½
Grand Prize	13-32	7-16	13-32	11-32	½	½
Hale & Norcross	1½	1⅝	1½	1⅝	1¾	1½
Manhattan	.....	.....	.....	.....	.....	.....
Martin White	4	.....	.....	4	4⅛	4
Mexican	3¾	4⅛	4	4¼	4⅛	4⅜
Mono	11-32	5-16	11-32	...	5-16	11-32
Mount Diablo	.....	.....	3½	.....	.....	3¾
Navajo	5½	5⅛	5¼	5½	5⅝	5⅝
Northern Belle	11½	.....	.....	11½	.....	.....
Noonday	13-32	11-32	11-32	11-32	13-32	13-32
Ophir	3	3¼	3⅛	3⅜	3⅞	3¾
Oro	5-32	3-32	3-32	5-32	.....	.....
Overman	.....	3-16	3-16	¼	¼	.....
Potosi	1¼	1⅛	1⅝	1⅝	1⅝	1¼
Savage	1	15-16	1	1⅛	1¼	1
Scorpion	11-32	13-16	29-32	29-32	15-16	29-32
Sierra Nev	5⅛	5⅝	5⅞	6⅛	6⅞	6¾
Silver King	.....	12¾	12½	13	12½	.....
Tip Top	.....	.....	.....	.....	.....	2
Union Con	4½	4¾	4½	4⅞	5⅛	5
Wales Con	.....	.....	.....	.....	.....	.....
Yellow Jacket	1½	1⅝	1⅝	1⅝	1½	1½

MEETINGS.

Globe City Mining Company, Room 56, Bible House, Astor Place. Meeting of stockholders, November 15th, at twelve M.

New Castle Coal and Mineral Land Company, 54 William street. Special meeting of stockholders, November 18th, at twelve M., to elect trustees and vote on proposition to lease certain of its lands.

Vermont Copper Company, 115 Broadway. Annual meeting of stockholders and election of trustees, November 22d, at ten A.M.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	SHARES. No. in 1000's	SHARES. Par Value.	ASSESSMENTS. Lev'd to date in 1000's.	ASSESSMENTS. Date and amount per share of last.	DIVIDENDS. Total paid to date in 1000's.	DIVIDENDS. Date and amount per share.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. Oct. 28. H.	Oct. 28. L.	Oct 30. H.	Oct 30. L.	Oct. 31. H.	Oct. 31. L.	Nov. 1. H.	Nov. 1. L.	Nov. 2. H.	Nov. 2. L.	Nov. 3. H.	Nov. 3. L.
Alice, Mon	400	25	*	.....	400	De 81 10	.....	.....	.....	.....	2.20	.....	.....	.....	.....	.....	.....	.....
Amie Con., Co	300	10	*	.....	305	My 80 10	.12	.10	.11	.10	.12	.11	.12	.10	.10	.....	.11	.....
Atlantic, Mich	40	25		.....	140	Fe 82 2 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argenta, Ne	100	100	200	Se 82 25	40	Fe 80 20	.40	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bar & Walker, Ut	100	10	*	.....	60	No 80 ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bassick, Co	100	100	*	.....	25	Fe 80 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belle Isle, Ne	100	100	65	My 82 10	300	De 79 25	.26	.....	.....	.....	.....	.....	.....	.....	.30	.26	.....	.....
Black Bear, Ca	90	100	15	Se 79 50	889	Se 82 30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belcher, Ne	104	100	2562	Se 82 25	15397	Ap 76 1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bodie Cons., Ca	100	100	125	De 81 50	1295	No 82 20	.....	.....	3.50	.....	3.50	.....	3.50	.....	3.50	.....	3.65	3.50
Bos'n & Mon, Mon	200	10		.....	200	No 82 05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Breese, Co	200	25	*	.....	2	Fe 80 1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bulwer, Ca	100	100	30	De 77 50	120	No 82 10	1.20	.....	1.15	.....	.....	.....	1 25	.....	.....	.....	.....	.....
California, Ne	540	100	530	Se 82 25	31320	De 79 50	.30	.29	.28	.27	.32	.28	.31	.29	.33	.....	.....	.....
Cal. & Hecla, Mich	100	25		.....	22350	No 82 5 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Caribou Con., Co	100	10	*	.....	50	Mr 80 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Caro Ina Q'n, N.C	100	2		.....	6	Se 82 02	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Castle Creek, Id	100	1		.....	18	No 82 03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Catalpa, Co	300	10	*	.....	180	My 81 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chrysolite, Co	200	50	*	.....	1600	De 81 50	1.60	.....	.....	.....	1 3	1.30	1.50	1.40	1.55	1.55	1.50	1.45
Climax, Co	200	10	*	.....	180	Au 80 30	.....	.....	.05	.....	.06	.05	.05	.....	.04	.....	.06	.....
Coas. G. Mg., Ga	100	5	*	.....	64	Au 82 04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cons. Va., Ne	540	100	897	Au 82 30	42990	Au 80 50	.79	.74	.75	.69	.80	.70	.86	.78	.80	.75	.80	.78
Copper Queen, Ar	250	10	*	 82	500	Se 82 50	.....	.....	.....	.....	5.00	.....	.....	.....	.....	.....	.....	.....
Crown Point, Ne	100	100	2673	Fe 82 25	11583	Ja 75 2 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.80	.....
D'dw'd-Terra, Dk	200	25	*	.....	835	Oc 82 15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dunkin, Co	200	25	*	.....	200	Ju 81 7½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Eureka Cons., Ne	50	100	100	My 76 1 00	‡	Jy 82 25	12.00	.....	12.00	.....	12.00	10 75	12.00	11.50	12.75	12.50	12.75	.....
Evening Star, Co	50	10	*	.....	1225	Oc 82 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Excelsior, Ca	100	100	300	Ja 82 1 00	875	Oc 81 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fa. de Smet, Dk	100	100		.....	510	No 82 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Findley, Ga	200	1	*	.....	8	My 79 1*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Freeland, Co	200	25	*	.....	50	My 80 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Glass-Pend., Co	250	20	*	.....	25	My 81 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gold Stripe, Ca	150	10	*	.....	76	Jy 81 15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gld & Curry, Ne	108	100	3473	Se 82 50	3826	Oc 70 $10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3 80	.....
Grand Prize, Ne	100	100	395	Se 82 25	450	Se 80 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.55	.....
Great Eastern, Dk	300	1	*	.....	16	Jy 80 01	.03	.....	.03	.....	.02	.....	.02	.....	.02	.....	.03	.....
Gr. Mountain, Ca	125	10	*	.....	212	No 81 7⅛	.52	.50	.51	.....	.52	.51	.60	.....	.63	.60	.60	.....
Hale & Nor., Ne	112	100	4008	Se 82 50	1598	Ap 71 5 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hall-And's'n, N.S.	150	1		.....	7	Ja 82 05	2.30	2.20	2.00	.....	.....	.....	.....	.....	.....	.....	2.10	2.00
Hecla Con., Mon	30	50		.....	342	Ap 82 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hibernia, Co	300	25	*	.....	180	Jy 81 40	.....	.....	.....	.....	.04	.....	.03	.02	.03	.02	.03	.....
Homestake, Dk	100	100	200	Ap 78 1 00	1062	Oc 82 40	17.25	.....	.....	.....	17.50	17.38	.....	.....	17½	.....	.....	.....
Horn-Silver, Ut	400	25	*	.....	1700	No 82 75	8.00	7 63	8.00	.....	8.13	.....	.....	.....	.....	.....	8 25	8.00
Hukill, Co	200	5	*	.....	210	De 78 10	.15	.14	.....	.....	.....	.....	.....	.....	.13	.....	.12	.....
Indep., Ne	100	100	185	Fe 82 15	225	Se 79 05	.87	.....	.94	.93	1.00	.80	.90	.88	.....	.....	.92	.90
In. Queen, Ne	125	2	12	No 79 10	355	Se 82 05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Inyo, Ca	100	5	*	.....	45	Ap 82 05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iron Silver, Co	500	20	*	.....	800	Oc 82 20	2.25	.....	2.20	2.20	2.30	.....	.....	.....	2.25	.....	2.30	.....
Joculstita, Mex	100	100		.....	550	Au 82 1 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
La Plata, Co	200	10	*	.....	610	Se 82 30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Leadville C., Co	400	10	*	.....	250	No 82 05	.60	.....	.....	.....	.61	.60	.71	.....	.70	.....	.....	.....
Leeds, Ut	60	100	87	Ju 82 50	78	Oc 78 15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Little Chief, Co	200	50	*	.....	700	Au 80 50	.51	.50	.50	.....	.50	.....	.49	.....	.50	.....	.....	.....
Little Pitts., Co	200	100	*	.....	1350	Mr 80 50	.80	.....	1.00	.....	.90	.....	.....	.....	.90	.....	.95	.....
Martin White, Ne	100	100	950	Se 82 25	90	Jy 79 30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Moose, Co	200	10	4	.....	550	Mr 78 25	.06	.....	.....	.....	.06	.....	.....	.....	.....	.....	.....	.....
Morning Star, Co	100	10		.....	515	Oc 82 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Navajo, Ne	100	100	235	Mr 82 20	75	No 82 25	.....	.....	.....	.....	5.25	.....	5.63	.....	.....	.....	.....	.....
N. Y. & Colo., Col	50	20		.....	25	Jy 79 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N'h'n Belle, Ne	50	100		.....	2275	Oc 82 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
N. Belle Isle, Ne	100	100	55	Se 82 15	45	Se 82 15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.25	.....
Ontario, Ut	150	100		.....	470	No 82 50	.....	.....	.....	.....	37.00	27.00	.....	.....	.....	.....	37 50	.....
Ophir, Ne	100	100	3305	Jy 82 1 00	1595	Jy 82 1 00	.....	.....	.....	.....	3.25	.....	3.25	.....	3.75	3.63	3.50	.....
Osceola, Mich	50	25		.....	810	Se 82 1 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.00	.....
Plumas, Ca	100	10	*	.....	151	Jy 79 8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Quicks. Pref., Ca	43	100		.....	654	Ju 82 6 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41.50	.....
" Com., Ca	57	100		.....	151	Ju 82 40	.....	.....	.....	.....	10⅜	9.50	.....	.....	.....	.....	.....	.....
Quincy, Mich	400	25		.....	3220	Au 82 5 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rising Sun, Ca	150	5	*	.....	52	My 81 7½	.05	.....	.05	.....	.06	.....	.05	.....	.05	.....	.06	.....
Robinson Cs., Co	200	50	*	.....	575	No 81 50	1.60	1.50	1.65	1.50	1.70	1.65	1.60	1.50	1.55	1.40	1.50	1.40
Robt. E. Lee, Co	500	500		.....	50	Jy 81 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Savage, Ne	112	100	3692	Se 82 25	4460	Ju 69 3 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sierra Nev., Ne	100	100	5050	Se 82 1 00	102	Ja 71 1 00	.....	.....	.....	.....	.....	.....	7.13	6.63	7.00	6.25	7.00	6.75
Silver King, Ar	100	100	.....	.....	1175	Oc 82 25	.....	.....	.....	.....	.....	.....	.....	.....	13 25	.....	.....	.....
Silver King, Co	500	2	.....	.....	50	Ja 81 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Socorro, N. Mex	2.5	100	.....	.....	4	Mr 82 ¾	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sprig Valley, Ca	200	1	*	.....	50	Ja 81 25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Standard, Ca	100	100	.....	.....	3975	No 82 25	.....	.....	.....	.....	.....	.....	6.00	.....	6.00	.....	6.13	.....
Starr-Grove, Ne	200	10	*	.....	16	Ju 81 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stormont, Ut	200	1	*	.....	155	No 81 05	.....	.....	.....	.....	.....	.....	.....	.....	.35	.....	.....	.....
St. Joseph, Mo	100	10	*	.....	370	Se 82 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tip Top, Ar	100	100	170	Mr 80 50	100	No 81 20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tombstone, Ar	500	25	*	.....	1350	Ap 82 10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vizina, Ar	200	25		.....	140	Mr 82 10	.....	.....	1.10	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yellow Jacket	120	100	5838	Fe 82 1 00	2184	Au 71 2 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Non-assessable. † The Deadwood has previously paid $275,000 in eleven dividends, and the Terra $75,000. ‡ 48175.

SALES.—Alice, 100; Amie Consolidated, 20,500; Argenta, 24; Belle Isle, 600; Bodie Consolidated, 1120; Bulwer, 350; California, 4920; Chrysolite, 9345; Climax, 6400; Consolidated Virginia, 12,700; Copper Queen, 100; Crown Point, 100; Eureka Consolidated, 1100; Gould & Curry, 50; Grand Prize, 100; Great Eastern, 9300; Green Mountain, 4700; Hall-Anderson, 5200; Hibernia, 9900; Homestake, 600; Horn-Silver, 810; Hukill, 900; Independence, 2200; Iron Silver, 1000; Leadville Consolidated, 1200; Little Chief, 1400; Little Pittsburg, 360; Moose, 1500; Navajo, 400; North Belle Isle, 200; Ontario, 80; Ophir, 370; Quicksilver, preferred, 500; Quicksilver, common, 400; Rising Sun, 11,800; Robinson Consolidated, 108,650; Sierra Nevada, 1275; Silver King, 15; Standard, 145; Stormont, 1000; Vizina, 100. Dividend shares sold, 221,514.

DIVIDENDS.

The Bodie Consolidated Mining Company, of California, has declared dividend No. 12, of twenty cents a share, payable November 15th. Eastern stockholders of record will be paid at the office of Laidlaw & Co., No. 14 Wall street, New York. Transfer-books will close November 3d.

The Bulwer Consolidated Mining Company, of California, has declared a dividend of ten cents per share, payable November 13th, 1882, at the office of the Farmers' Loan and Trust Company. Transfer-books closed on November 2d, and will open November 14th.

The Castle Creek Gold Mining Company, of Idaho, has declared a dividend, No. 6, of three per cent on the capital stock, payable November 15th. Transfer-books close on the 10th.

The Leadville Consolidated Mining Company, of Colorado, has declared a dividend of five cents per share, payable November 15th. Transfer-books close November 10th, and reopen November 20th.

The Navajo Mining Company, of Nevada, has declared a dividend of twenty-five cents per share, payable November 13th, at San Francisco.

The Standard Consolidated Mining Company, of California, has declared a dividend (No. 47) of twenty five cents per share, payable November 13th. Transfer-books close on the 4th.

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, Nov. 2.

The market shows a slight improvement in the volume of business, although prices, as a rule, are a shade lower. The copper stocks, especially the dividend-paying mines, are quite irregular, prices being governed by the orders to buy or sell. Calumet & Hecla declined from $247@$246½, on an order to sell 15 shares, while the very next order to buy a small lot sent the price up to $249, and to-day 10 shares sold at $249½. Quincy sold early in the week at $69@$69½; since, however, it has gradually declined to $67¼, which was the price to-day. Franklin has been very dull of late, but the price ruled quite steady, at $15@$15½, until to-day, when an order to sell 100 shares caused a decline to $14. The expected dividend has not as yet been announced. Pewabic has steadily declined on the

pressure to sell, from $93¼@$71⅛, with a slight rally later to $8, which is now bid. The air is full of rumors of an assessment soon to be levied, but we can not learn that any action has been taken by the directors in that direction. The reports from the mine are rather favorable, and it may be that the money will not be needed at present. Osceola declined, on small sales, to $34; but advanced to-day to $35, at which a sale of 40 shares was made. Huron advanced from $2½@$3; but more stock coming on the market than these orders to buy, the price was forced down to $2¼, with a slight improvement to-day at $2⅝, which was bid. National sold at $1½@$1⅝; Allouez, steady at $2. Brunswick Antimony advanced from $8@$9.

In silver stocks, Bonanza declined to $3; but later sold at $3⅛, and closed $3¼ bid. Catalpa and Crescent have both been rather quiet the past week. The former declined from $1.30@$1.12½, but subsequently rallied to $1.20, and closed $1.15 bid, $1.20 asked. Crescent declined from 50 @40c., with later sales at 42½c. Silver Islet sold at $10, and also at $11, assessment, $1, paid. Sullivan sold at $1¾@$2.

At the Boston Mining and Stock Exchange, there has been no special feature of interest. The business in railroad and other stocks besides mining is gradually increasing, and the prospect is good for a fair share of the orders in that direction. Empire has been rather active at a decline from 39@35c.; but to-day there was an increased demand, which advanced the stock to 39c. again, and it looks as if it would go still higher. Massachusetts & New Mexico, steady at 20@22c.

3 P.M.—The market this afternoon was very dull and inactive. Quincy sold at $67¼, same as before. Closing prices: Allouez, $2 bid; Atlantic, $15⅛ bid, 16⅛ asked; Antimony, $10 bid; Bonanza, $3¼ bid, $3½ asked; Calumet & Hecla, $249 bid, $250 asked; Catalpa, $1.15 bid, $1.20 asked; Crescent, 40c. bid, 45c. asked; Franklin, $14 bid, $15 asked; Harshaw, $1¼ bid, $1⅛ asked; Osceola, $33½ bid; Pewabic, $8¼ bid, $8⅝ asked; Quincy, $67 bid, $67½ asked; Silver Islet, $10 bid; Sullivan, $1½ bid, $2 asked; San Pedro, 30c. bid, 35c. asked.

BULLION MARKET.

NEW YORK, Friday Evening, Nov. 3.

DATE.	London Pence.	N. Y. Cents.	DATE.	London Pence.	N. Y Cents.
Oct. 28....	51⅝	*	Nov. 1.....	51½	112¼
Oct. 30. ..	51⅝	*	Nov. 2.....	‡	112⅜
Oct. 31...	51½	†	Nov. 3.....	51⅜§	¶

*112¼@112⅜. † 112½@112¼. ‡ 51⅝@51¾. § Unsettled. ¶ 112⅜@112½.

BULLION PRODUCTION FOR 1882.

MINES.	States.	For the week.	Month of October.	Year from Jan. 1st, 1882.
*Alice, G. S...	Mont...	.....	.....	$644,293
*Alta-Montana, G. S. L.	"	.....	.....	303,996
Barbee & Walker, S...	Utah..	$3,500	$11,141	73,642
Betty O'Neal, S.....	Nev....	.....	.....	59,220
*Black Bear, G.....	Cal....	.....	.....	54,938
Bodie, G. S.....	"	10,720	41,330	338,704
*Boston & Montana, G.	Mont..	.....	.....	208,950
*Caledonia, G.....	Dak...	.....	.....	62,235
*Caribou, S	Colo....	.....	.....	126,918
*Central Arizona, S...	Ariz...	.....	.....	140,154
*Christy, S.....	Utah....	.....	.....	254,888
*Chrysolite, S. L	Colo....	.....	.....	278,908
Cons. Bobtail, G.....	"	.....	.....	83,477
*Contention, S.....	Ariz ..	.....	.....	1,411,049
Crismon-Mammoth, G.	Utah..	.....	.....	63,579
*Custer, G. S.....	Idaho..	.....	.....	619,258
*Deadwood-Terra, G...	Dak....	.....	.....	491,481
*Derbec Blue Grav., G.	Cal	.....	.....	115,370
*Eureka Con., G. S. L..	Nev....	.....	35,090	776,928
Evening Star, S. L.....	Colo....	.....	.....	642,520
Father de Smet, G....	Dak....	.....	11,062	292,604
*Frisco M. & S.Co., S. L	Utah....	.....	.....	271,473
Girard, S.....	Ariz...	.....	.....	90,964
Grand Central, S.....	"	.....	.....	905,000
*Hall-Anderson, G....	N. S....	.....	.....	7,301
Head Center, S.....	Ariz...	.....	18,230	84,177
*Homestake, G.....	Dak....	.....	.....	882,651
Horn-Silver, S. L.....	Utah..	82,500	300,000	2,883,766
*Hope, S.....	Mont...	.....	.....	240,145
Idaho, G.....	Cal	.....	.....	395,540
Independence.....	Nev....	4,000	11,850	11,850
*Indian Queen, S	"	.....	.....	138,697
Inyo Cons., G.....	Cal	.....	.....	46,421
Ingersoll, S.....	Ariz...	.....	.....	90,000
Iron Silver, S	Colo....	.....	.....	865,436
*Jocuistita, S.....	Mex....	.....	.....	600,419
*†Leeds, S.....	Utah....	.....	.....	11,988
*Little Pittsburg, S. L.	Colo. ..	.....	.....	118,543
Manhattan, S.....	Nev....	.....	.....	64,300
Morning Star, S. L...	Colo....	.....	.....	333,126
Mount Diablo, S.....	Nev....	.....	.....	179,445
*Navajo, G. S.....	"	16,000	48,140	184,428
New York Hill, G.....	Cal	.....	.....	56,256
Noonday, G.....	"	.....	.....	57,690
North Noonday, G	"	.....	.....	56,545
Northern Belle, S.....	Nev....	22,190	82,469	648,414
*‡Ontario, S. L.....	Utah....	.....	.....	1,935,048
Ophir, G. S.....	Nev. ..	.....	.....	39,472
*Oxford, G.....	N. S....	.....	.....	13,420
Pascoe, S.....	Utah....	.....	.....	4,575
*Pleasant Valley, G. S.	Cal	.....	.....	31,938
Robert E. Lee, S.....	Colo....	.....	.....	292,550
Savage, S.....	Nev....	.....	.....	3,500
*Silver Bow, G. S....	Mont...	.....	.....	236,100
Silver King, S	Ariz....	.....	.....	258,632
*Spring Valley, G....	Cal	.....	.....	152,000
Standard, G.....	"	20,032	114,585	905,546
Star, S.....	Nev....	1,150	5,200	45,096
Stormont, S.....	Utah....	3,500	13,430	241,874
Syndicate, G.....	Cal ..	...	10,500	29,929
Tintic M. & M. Co....	Utah....	.....	8,650	35,184
*Tip Top, S.....	Ariz....	.....	.....	191,034
*Tombstone, G. S.....	"	.....	.....	590,286
Union Con., S.....	Nev....	.....	.....	217,623
Vizina, S.....	Ariz....	.....	.....	143,200
Total amount of shipments to date.....				$21,654,844

* Official. † Net. ‡ Assay value. *G. Gold. S. Silver. L. Lead.*

NON-DIVIDEND PAYING MINES.

NAME AND LOCATION OF COMPANY.		NUMBER OF SHARES.	Par.	ASSESSMENTS. Total levied to date.	ASSESSMENTS. Date and amount of last.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. Oct. 28. H.	Oct. 28. L.	Oct. 30. H.	Oct. 30. L.	Oct. 31. H.	Oct. 31. L.	Nov. 1. H.	Nov. 1. L.	Nov. 2. H.	Nov. 2. L.	Nov. 3. H.	Nov. 3. L.
Advance.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Albion, S. L.....	Nev.	150,000	100	397,500	Jun. 82	25	....	....	....	....	....	....	....	....	....	....	....
Allouez.....	Mich	....	....	420,000	Mar. 82	50	....	....	....	....	....	....	....	....	....	....	....
Alpha.....	Nev.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Alta.....	Nev.	100,800	100	1,641,600	May 82	50	....	....	....	....	....	....	....	....	....	....	....
Alta-Montana, G..	Mon.	500 000	10	*	....	....	15c	.....	20c	19c	19c	18c	16c	15c	17c	....	17c	16c
Am. Flag, S	Colo	125,000	10	300,000	Jun. 77	25	....	....	....	....	....	....	....	....	....	....	....	....
Barcelona, G.....	Nev	200,000	25	*	....	....	7c	....	7c	....	....	....	....	....	....	....	8c	.....
Battle Creek.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Bear Creek	Cal..	360,000	1	....	....	....	27c	....	....	....	....	....	....	....	....	....	....	....
Beauce.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Bechtel Con., G....	Cal..	100,000	100	175,000	Nov. 82	10	....	....	....	....	....	....	....	....	2c	....	....	....
Best & B'cher, G. S	Nev.	100,800	100	1,295,390	Jul. 82	50	....	....	5.50	....	5.88	....	6.50	....	....	....	6.25	....
Big Pittsburg, S. L	Colo	200,000	100	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Black Jack, G....	Cal.	100,000	2½	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Bonanza Chief...	Mon	1,000,000	1	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Bondholder	Colo	200,000	2½	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Boston Con., G...	Cal..	100,000	100	70,000	May 82	20	....	....	....	....	....	....	....	....	....	....	....	....
Boulder Con.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Bradshaw, S.....	Ariz	225,000	10	....	....	....	37c	.....	38c	36c	37c	35c	39c	36c	38c	.....	40c	39c
Buckeye	Colo	400,000	5	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
" pref.....	....	....	....	....	....	....	30c	....	....	....	31c	30c	....	....	....	....	31c	30c
Bull-Domingo, S L	Colo	500,000	50	*	....	....	4c	....	....	....	5c	....	....	....	....	....	....	....
Bullion, G. S.....	Nev.	100,000	100	3,747,000	Oct. 82	50	....	....	....	....	....	....	....	....	....	....	....	....
Bye and Bye.....	Ariz	100,000	10	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Calaveras, G	Cal..	500,000	1	*	....	....	5c	....	....	....	....	....	....	....	....	....	....	....
C'lav'r's W.&M.Co	Cal..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cal., B. H., G. ...	Dak.	100,000	100	480,000	Au. 82	15	....	....	....	....	....	....	2.00	1.75	....	....	....	....
Carbonate Hill, S L	Colo	200,000	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Catskill, S.....	Nev.	300,000	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Central Ariz'na, S	Ariz	100,000	100	....	....	....	55c	....	....	....	55c	....	60c	....	55c	....	55c	.....
Chapparal.....	Cal..	....	....	....	....	....	3c	....	....	....	....	....	....	....	2c	....	....	....
Cherokee, G.	Cal.	150,000	10	....	....	....	....	....	....	....	....	....	....	....	18c	17c	17c	16c
Chollar.....	....	....	....	....	Sep. 82	50	....	....	....	....	....	....	....	....	....	....	....	....
Clarence.....	Can.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Colorado Cent'l, S	Colo	300,000	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Col'mb'a Con., G.S	Nev.	100,000	50	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cons. Imp'ri'l, G.S	Nev.	500,000	100	1,425,000	Jan. 82	10	7c	....	....	....	....	....	7c	....	6c	....	....	....
Con. Pacific, G....	Cal.	60,000	100	141,000	Au 82	25	....	....	....	....	....	....	....	....	....	....	....	....
Crescent, S L.....	Colo	300,000	10	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Crowell, G.....	N. C.	500,000	1	....	....	....	5c	....	....	....	5c	....	4c	....	5c	4c	....	....
Dahlonega, G.....	Ga.	250,000	1	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Dardanelles, G....	Cal.	100,000	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Decatur.....	....	....	....	....	....	....	....	72c	67c	70c	68c	69c	64c	64c	.....	68c	61c	63c	60c
Dunderberg, S....	Colo	150,000	10	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Durango, G.....	Dak.	500,000	1	*	....	....	9c	8c	9c	....	9c	....	9c	....	9c	....	....	....
Eastern Oregon..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Empire, S.....	Ut'h	100,000	100	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Enterprise.....	Colo	....	....	....	....	....	59c	....	59c	....	59c	....	59c	58c	60c	.....	60c	59c
Exchequer.....	Nev.	100,000	100	630,000	Jan. 82	25	....	....	....	....	....	....	....	....	....	....	....	....
Globe Copper..	Ariz.	....	....	....	....	....	4c	....	....	....	4c	....	4c	....	4c	....	4c	....
Gold Placer, G....	Colo	200,000	25	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Goodshaw, G.....	Cal..	100,000	100	200,000	Oct. 82	10	....	....	10c	....	....	....	....	....	....	....	....	....
Granville, G.....	N. C.	300,000	1	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Harshaw, S.	Ariz	100,000	100	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Head Center, S...	Ariz	100,000	100	160,000	May 82	20	....	....	....	....	....	....	....	....	....	....	....	....
Hortense, S.....	Colo	200,000	10	....	....	....	15c	....	....	....	....	....	....	....	....	....	....	....
Index.....	Cal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Julia, G S.....	Nev.	110,000	100	1,394,000	Jan. 82	20	....	....	....	....	....	....	....	....	....	....	....	....
Kossuth, G S.....	Nev.	108,000	100	421,200	Aug. '7	15	....	....	....	....	....	....	....	....	....	....	....	....
Lacrosse, G.....	Colo	100,000	10	*	....	....	13c	....	....	....	....	....	....	....	....	....	....	....
Leviathan, S.....	Nev	100,000	100	380,000	Sep. 82	25	....	....	....	....	....	....	....	....	....	....	....	....
Lucerne, S.....	Colo	500,000	10	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mariposa Pref.. G	Cal.	50,000	100	1,687,500	Dec. 81	....	....	....	....	....	....	....	....	....	....	....	....	....
" Com., G.	Cal.	100,000	100	1,950,000	Feb. 82	....	....	....	....	....	....	....	....	....	....	....	....	....
May Belle, G.....	Cal.	100,000	100	84,000	Dec. 81	20	....	....	....	....	....	....	....	....	....	....	....	....
Mayflower, S.....	Colo	100,000	100	*	....	....	....	....	....	....	....	....	....	....	....	....	10c	....
Mexican, G. S.....	Nev.	100,800	100	2,146,600	Oct. 82	$1	....	....	4.25	....	....	....	5.50	4.25	....	....	5.75	4.75
Michoacan Synd..	Mex.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Miner Boy, G S L.	Colo	500,000	10	*	....	....	3c	....	3c	....	4c	....	3c	....	....	....	6c	.....
Miller.....	Nev.	200,000	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mono, G.....	Cal.	50,000	100	512,500	Sep. 82	25	....	....	....	....	....	....	....	....	20c	....	....	.....
Moose Silver, S....	Colo	300,000	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Nevada Syndi.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
North Standard, G	Cal..	100,000	100	20,000	Nov. 81	10	....	....	....	....	....	....	....	....	....	....	....	....
N. Horn-Silv'r, S L	Utah	400,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Noonday.....	Cal..	60,000	10	148,000	Sep. 82	25	....	....	....	....	....	....	....	....	....	....	....	....
Old Dominion, C..	Ariz	200,000	100	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Oriental.....	Nev.	200,000	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ori'nt'l & Miller, S	Nev.	400,000	25	....	....	....	15c	13c	19c	15c	18c	15c	17c	15c	17c	16c	17c	.....
Overman, G S	Nev.	115,200	25	3,604,700	May 82	25	....	....	....	....	....	....	....	....	....	....	....	....
Potosi.....	Nev.	112,000	100	476,000	Sep. 82	25	....	....	....	....	....	....	....	....	....	....	....	....
Quartz Creek..	....	....	100	....	....	....	8c	....	....	....	....	....	....	....	....	....	....	....
Rappahannock, G	Va.	250,000	....	*	....	....	....	....	....	....	....	....	12c	.....	12c	11c	....	.....
Red Elephant, S..	Colo	500,000	1	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Retort.....	....	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
San Pedro, G S L..	N. M	400,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Silver Cliff, S....	Colo	200,000	25	*	....	....	84c	79c	91c	83c	....	....	88c	85c	85c	80c	85c	84c
Silver Islet.....	Can.	....	50	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sonora Con.....	Mex.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
South Bodie, G....	Cal.	100,000	....	100,000	Mar. 82	15	....	....	....	....	....	....	....	....	....	....	....	....
South Bulwer, G..	Cal.	100,000	100	195,000	May 81	25	....	....	....	....	....	....	....	....	....	....	....	....
South Hite.....	Cal..	100,000	100	....	May 82	10	....	....	30c	....	....	....	30c	....	32c	....	....	....
South Pacific.....	Cal.	....	5	....	....	....	14c	12c	13c	12c	13c	10c	13c	12c	13c	12c	13c	.....
State Line No. 1, S	Nev.	200,000	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
" No. 2, S....	Nev.	200,000	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
" No. 3, S....	Nev.	200,000	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
" No. 4, S....	Nev.	200,000	25	....	....	....	....	....	....	....	5c	....	....	....	....	....	....	....
" Nos. 1 & 4, S	Nev.	.....	25	....	....	....	....	....	5c	....	6c	....	....	....	....	....	6c	.....
" Nos. 2 & 3, S	Nev.	....	....	....	....	....	14c	13c	18c	15c	17c	15c	15c	.....	16c	15c	16c	.....
Sutro Tunnel.....	Nev.	2,000,000	....	*	....	....	31c	25c	30c	28c	30c	29c	33c	30c	32c	29c	30c	.....
Taylor-Plumas ...	....	....	10	....	....	....	14c	13c	15c	14c	15c	14c	14c	.....	14c	13c	14c	.....
Tioga, G.....	Cal.	100,000	....	285,000	Oct. 82	10	....	....	....	....	....	....	....	....	....	....	....	....
Tuscarora, S.....	Nev.	100,000	100	110,000	Oct. 81	15	8c	7c	7c	....	7c	....	8c	....	8c	....	9c	8c
Unadilla, S.....	Colo	500,000	100	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Union Cons., G. S.	Nev.	100,000	1	1,460,000	Oct. 82	$1	....	....	....	....	....	....	5.00	....	....	....	6.38	.....
Utah.....	Nev.	20,000	100	1,340,000	Oct. 82	$1	....	....	....	....	....	....	....	....	....	....	....	....
Vandewater, S....	Nev.	200,000	100	*	....	....	....	....	....	....	18c	....	19c	....	....	....	....	....
Washington, S....	Ariz.	200,000	10	....	....	....	....	....	8c	....	10c	6c	12c	11c	....	.....	13c	.....
Whalen Copper...	Nev.	100,000	25	....	....	....	21.75	21¾	21.75	21¾	21.75	....	....	....	21¾	21.75	....	....
Wide West.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Willshire, G.....	Cal .	50,000	5	*	....	....	....	....	....	....	....	....	....	....	....	....	....	....

* Non-assessable.

SALES.—Alta-Montana, 12,000; Barcelona, 3600; Bear Creek, 300; Bechtel Consolidated, 200; Best & Belcher, 350; Bradshaw, 10,800; Buckeye, preferred, 1300; Bull-Domingo, 500; Calaveras, 1000; Caledonia, B. H., 1700; Central Arizona, 1000; Chapparal, 31,000; Cherokee, 2700; Consolidated Imperial, 2000; Crowell, 6400; Decatur, 21,800; Durango, 4900; Enterprise, 6200; Globe Copper, 7700; Goodshaw, 600; Hortense, 300; Lacrosse, 200; Mayflower, 300; Mexican, 585; Miner Boy, 104,500; Mono, 50; Oriental & Miller, 25,400; Quartz Creek, 100; Rappahannock, 1500; Silver Cliff, 18,200; South Hite, new, 1800; South Pacific, 35,350; State Line, No. 4, 100; State Line, Nos. 1 & 4, 4200; Nos. 2 & 3, 14,500; Sutro Tunnel, 21,700; Taylor-Plumas, 22,500; Tuscarora, 10,300; Union Consolidated, 95; Vandewater, 600; Washington, 9200; Whalen Copper, 410. Non-dividend shares sold, 387,440. Total shares sold at all the Exchanges, 668,954.

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ended November 3d, as compiled from various sources, amounted to $155,000, as against $233,000 reported for the previous week. The receipts from January 1st, 1882, to date, are $11,632,059.51.

Foreign Bank Statements.—The governors of the Bank of England at their weekly meeting made no change in the bank's minimum rate for discount, and it remains at 5 per cent. During the week, the bank lost £830,000 bullion, but the proportion of its reserve to its liabilities was reduced from 36 7-16 to 33 15-16 per cent, against 37 11-16 per cent at the same date last year. The weekly statement of the Bank of France shows a gain of 1,375,000 francs gold, and a loss of 3,625,000 francs silver.

Exports and Imports of Gold and Silver at New York.

Exports.

Week ended October 28th.....	$56,620
Corresponding week last year...	176,618
Since January 1st, 1882.....	44,443,927
Corresponding period last year.....	9,322,325

Imports.

Week ended October 28th.....	$335,736
Corresponding week last year.....	1,542,197
Since January 1st, 1882.....	4,280,929
Corresponding period last year.....	51,728,493

United States Assay-Office at New York.—The following

BOSTON MINING STOCKS.

	Oct. 26.		Oct. 27.		Oct. 28.		Oct. 30.		Oct. 31.		Nov. 1.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allouez	2.00	.....	2.50	.....	2.12½	.....	2.00	.....	2.00	.....	.....	.....	800
Atlantic	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aztec	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Hill	.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Bodie Con	.....	.....	.....	.....	.....	.....	3.37½	.....	.....	.....	.....	.....	100
Bonanza D	3.50	3.37½	3.37½	3.00	.....	.....	3.12½	3.00	3.12½	.....	.....	.....	1,500
Bruns. Ant	8.00	.....	.....	.....	.....	.....	.....	.....	8.00	.....	9.00	.....	85
Bulwer	1.17	.....	.....	.....	.....	.....	.....	.....	1.12	.....	.....	.....	200
Cal. & Hec	247	.....	.....	.....	240½	.....	.....	.....	.....	.....	2.49	.....	56
Carbon. Hill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Catalpa	1.30	1.27½	1.30	1.27½	1.25	.....	1.25	1.17½	1.15	1.12½	1.20	.....	2,950
Central Ariz	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cherryfield	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chrysolite	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Con. V'ginia	.....	.....	.68	.....	.....	.....	.78	.....	.....	.....	.....	.....	200
Copp'r Falls	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Crescent	.51	.50	.50	.47½	.50	.47½	.47½	.45	45	.....	.42½	.40	2,900
Cumberl'd	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
"Cusi"	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Deer Isle	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denver City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Douglas	1.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Duncan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dunkin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Empire	.42	.....	.40	.39	.39	.37	.36	.35	.36	.35	.....	.....	4,875
Eureka	.....	.....	.....	.....	11.50	.....	.....	.....	.....	.....	.....	.....	10
Franklin	.....	.....	.....	.....	.....	.....	15.00	.....	15.00	.....	14.00	.....	160
Hancock G	5.00	.....	.....	.....	5.00	.....	5.25	5.00	5.37½	5.25	.....	.....	1,200
Harshaw	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Huron	2.59	.....	.....	.....	3.00	2.87½	2.75	2.62½	2.37½	2.25	2.25	.....	1,775
Independ'ce	1.05	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	200
Indian Q'n	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Little Pittsb	.....	.....	1.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Madison	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mammoth	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mass.& N.M.	.21	.20	.20	.....	.....	.....	.21	.20	.21	.20	.....	.....	7,450
Milton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Napa	4.75	.....	4.62½	.....	.....	.....	.....	.....	.....	.....	.....	.....	200
National	.....	.....	.....	.....	1.62½	1.50	1.62½	.....	.....	.....	.....	.....	400
North. Belle	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Osceola	.....	.....	.....	.....	.....	.....	34.00	.....	34.00	.....	34.00	.....	40
Penn-Breck	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pewabic	10.00	9.50	9.62½	9.50	.....	.....	9.00	7.87½	8.25	7.50	8.25	8.00	1,764
Pine Tree	.....	.....	.....	.....	.....	.....	.....	.....	.20	.....	.....	.....	5 0
Plymouth	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pontiac	.....	.....	.....	.....	.....	.....	.20	.....	.....	.....	.....	.....	100
Quincy	69.37	69.00	69.25	69.00	69.50	69.25	.....	.....	68.75	68.50	67.75	.....	288
Ridge	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Robinson	1.70	.....	.....	.....	1.50	.....	.....	.....	.....	.....	.....	.....	500
San Pedro	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Silver Islet	10.00	.....	10.00	.....	.....	.....	10.00	.....	.....	.....	11.00	.....	120
So. Pacific	.13	.....	.....	.....	.13	.....	.13	.....	.13	.....	.....	.....	1,600
Standard	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Star Copper	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
State Line Nos. 2 & 3	.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Stewart	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sullivan	.....	.....	.....	.....	.....	.....	1.75	.....	2.00	1.75	.....	.....	500
Sutro Tun	.....	.....	.32	.....	.....	.....	.30	.....	.....	.....	.....	.....	300
Sycamore	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Twin Lead	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vizina	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

PHILADELPHIA MINING STOCKS.

	Oct. 27.		Oct. 28.		Oct. 30.		Oct. 31.		Nov. 1.		Nov. 2.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
American	.17	.....	.....	.....	.16	.....	.18	.....	.17	.16	.19	.18	11,800
Argent	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Arizona So	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aztec	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Battle Mt	.03	.....	.02	.....	.03	.....	.....	.....	.....	.....	.....	.....	5,000
Black Sul	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buena	.05	.....	.04	.....	.....	.....	.....	.....	.05	.....	.05	.....	20,700
California	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Calista	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Comprom'e	.22	.....	.27½	.25	.37½	27½	37½	.35	.30	.....	.30	.....	27,300
Cons. Va	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dauntless	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Del Monte	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denver City	.....	.....	.24	.....	.25	.23	.22	.....	.24	.....	.24	.....	3,700
Fairview	.02	.....	.....	.....	.....	.....	.....	.....	.01	.....	.....	.....	3,000
Eureka	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Girard	.....	.....	.17	.16	.16	.....	.....	.....	.16	.....	.19	.17	6,700
Golconda	.....	.....	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,200
Golden Age	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Governor	.09	.....	.09	.....	.....	.....	.08	.....	.08	.....	.09	.....	9,000
Grand Uni'n	.....	.....	.07	.....	.07	.....	.07	.....	.07	.....	.07	.....	37,500
Gunnison	.....	.....	.80	.....	.82½	.80	.....	.....	.75	.....	.77½	.....	2,300
Hancock	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hibernia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Intervener	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iowa Gulch	.10	.....	.10	.....	.10	.....	.10	.....	.10	.09	.09	.....	21,300
King Bul'on	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ledger Con	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Little Dia'd	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Little Maud	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
L'g & D'y Hl	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
McCullough	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Magnolia	.02	.01	.02	.....	.02	.....	.02	.01	.02	.....	.02	.....	33,700
Montana	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mt. Lincoln	.....	.....	.....	.....	.02	.....	.....	.....	.....	.....	.....	.....	400
Mt.Sheridan	.....	.....	.....	.....	.04	.....	.....	.....	.....	.....	.04	.....	2,000
National	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Orion	.....	.....	.....	.....	.....	.....	.....	.....	.10	.....	.10	.....	1,100
Palmetto E	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pembina	.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	500
Penn-Breck	.22	.....	.19	.....	.....	.....	.18	.....	.18	.....	.20	.....	3,300
Permanent	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pizarro	.02	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9,200
Pizarro Ex	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Potosi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rara Avis	.....	.....	.....	.....	.....	.....	.....	.....	.09	.....	.....	.....	1,5
Rara Avis E	.....	.....	.....	.....	.....	.....	.06	.....	.06	.....	.....	.....	3,3
Rico Pion'r	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Pedro	.....	.....	.....	.....	.02	.....	.02	.....	.....	.....	.....	.....	8,000
Silver Cord	.....	.....	.....	.....	.....	.....	.....	.....	.70	.67½	.....	.....	2,700
Silv'r Plume	.....	.....	.....	.....	.01	.....	.....	.....	.....	.....	.....	.....	1,000
Silver Rock	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Standard	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sultana	.04	.03	.....	.....	.06	.05	.05	.....	.05	.....	.05	.....	7,500
Sutro Tun'l	.....	.....	.30	.....	.32½	.....	.....	.....	.30	.....	.32½	.....	1,400
Tombstone	.92½	.90	.92½	.90	.92½	.90	.90	.85	.87½	.....	.85	.....	10,550
Tranquility	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tyrone	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union Con	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Victor	.....	.....	.01	.....	.....	.....	.....	.....	.....	.....	.02	.....	3,000
Yale Mt	.60	.....	.60	.....	.62½	.....	.65	.....	.70	.62½	.....	.....	6,550
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

is the statement of business for the month ended October 31st, 1882:

Deposits of gold:		
Foreign coin, 1860	$299,000	
Foreign bullion	32,000	
United States bullion	616,000	
United States bullion (re-deposits)	150,000	
Jewelers' bars	92,000	
Refined gold	61,000—	$1,250,000
Deposits of silver:		
United States coin	100	
Jewelers' bars	16,100	
Foreign coin	13,600	
Foreign bullion	4,400	
United States bullion (contained in gold)	7,600	
United States bullion (re-deposits)	3,000	
United States bullion, Arizona	25,000	
United States bullion, Colorado	40,100	
United States bullion, Dakota	1,600	
United States bullion, Idaho	6,000	
United States bullion, Lake Superior	900	
United States bullion, Montana	149,500	
United States bullion, New Mexico	26,000	
United States bullion, Utah	166,000	
Refined silver	76,600—	536,500
Total deposits		$1,786,500
Gold bars stamped	$846,873	
Silver bars stamped	632,978—	1,479,851

United States Mint at Philadelphia.—The following is a statement of the coinage during the month of October, 1882:

Denomination.	Pieces.	Value.
Eagles	97,200	$972,000
Standard dollars	1,000,000	1,000,000
Dimes	710,100	71,010
Total silver	1,710,100	$1,071,010
Five cents	930,000	46,500
Cents	3,260,000	32,600
Total minor	4,190,000	$79,100

METALS.

NEW YORK, Friday Evening, Nov. 3.

Copper.—Absolutely nothing has occurred to change the status of affairs. Lake copper is still held at 18@18⅛c., while for Baltimore and Arizona brands 17⅛@17⅝c. is asked. England has further receded, the latest cable, yesterday, making Chili Bars £69 5s.

Lead.—Beyond the sale of 200 tons at 4·80c., and smaller lots at prices ranging upward to 4·90c., nothing has been done here. Buyers persistently hold off, and the heavy production is weighing on the market, especially as the season when manufacturers purchase supplies has passed over. The tendency seems downward, and the market now is decidedly weak. We quote nominally at the close 4·80c. for Common and 4·90c. for Refined, at which figure it is quite freely offered without finding takers. What larger amounts, if forced on the market, would realize, it is difficult to state. A considerable block of lead is still held by the parties who purchased the Richmond lead. The true condition of the market is perhaps more clearly reflected by its state at St. Louis, and this gives our usual Western dispatch special significance.

Messrs. John Wahl & Co., of St. Louis, write to us as follows to-day:

Our market has declined slowly since our last report, and is now dull and nominal. It was 4·62½c. for Soft Missouri, and 4·60c. for Hard until Monday. Then 100 tons Refined sold at 4·55c., and 250 tons November delivery, from 4·55 down to 4·50c. Sales during the last two days were 350 tons Refined at 4·50c., partly spot and partly November delivery. Receipts were 850 tons this week, against 950 tons last week.

According to these figures, the St. Louis market is equivalent to 4·75c. for Common, and 4·85c. for Refined here.

Tin.—During the week, there were forced sales at the Exchange from 22¾c. upward to 23c. Since, we are reported sales to consumers at 23¼c., and the market is firmly held, stocks being concentrated in a few hands. The estimates vary as to the amounts of spot stocks here between 1200 and 1700 tons. We quote at the close for spot: Straits, 23½c.; Australian, 24¼@24½c.; Lamb & Flag, 25½c.; and Banca, 28c.

Spelter.—This metal continues to be dull at 5·25c., nominally, for Domestic and Foreign. It is believed that concessions might be made. England cables to-day, £16 5s.

Antimony.—The tendency is downward, and the market is dull, at nominally 12¾@13c. for Cookson's; 10⅞@11c. for Hallett's; and 12½c. for Nevada.

Quicksilver.—We have no change to report here or in San Francisco. London is £5 18s.

One of our leading producers and receivers continues to be a large exporter of mercury upon owners' account, thus relieving the spot market very materially. It is difficult at all times to give any correct data as to the production of the several mines, for the reason that some of the largest mines retain more or less of their product at the works, shipping it to the city only when required for export or to fill sales made. The press, therefore, depends entirely upon the producers for such statements, and these are usually furnished periodically or whenever it is deemed advisable.

The price is 37¼@37½c. from the wharf, but some holders ask 37¾@38c., making a liberal discount for prompt cash. —*San Francisco Commercial Herald.*

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Nov. 3

American Pig.—Makers of pig-iron are showing a little more disposition to take orders, while buyers are less eager. We note the sale of 2000 tons of Chestnut Hill No. 2X and No. 2 pig at $24 and $22 respectively, and of 1000 tons of Thomas pig Nos. 1 and 2 at $24 and $26. We quote for standard to choice brands of Foundry No. 1, $25.50@$27; for No. 2, $22@$25; and $21@$22 for Gray Forge. Bessemer Pig is dull and quiet at $23.50. In England it is higher, being quoted 57s. 6d. by cable. Spiegeleisen continues dull at $28.50@$29 for 10 and 12 per cent, and $35.50@$36 for 20 per cent.

Scotch Pig.—Spot stocks here are very low lower, in fact, than they have been for two or thre years, being particularly small so far as prime brands are concerned. The arrivals, it is true, are free, but the iron is sold afloat. This renders holders of spot Scotch very firm, and has a tendency to limit transactions. We quote Coltness, $27.50@$28; Glengarnock, $25@$25.50; Gartsherrie, $25.50@$26; and Eglinton, $23.50@$24. The cable quotations at the Iron and Metal Exchange from Glasgow to-day are as follows: Warrants, 49s. 9d.; Carnbroe, 58s.; Gartsherrie, 64s.; Summerlee, 64s.; Coltness, 69s.; Langloan, 67s. 6d.; all at Glasgow; and Glengarnock, 57s. 6d.; Eglinton, 52s., at Ardrossan.

Rails.—The market is quiet, and there is but little doing. It seems that the readjustment of wages begun at the Western mills is likely to extend to those of the East also, Troy having made a beginning and Bethlehem being likely to follow. This is really nothing but a scaling down of wages in proportion to the enormous increase of output during the last few years, and would affect only the men who have received a specified price per ton of finished rails. We quote, as last week, $44@$46, with the market in buyers' favor. England cables to-day unchanged, £5 for Rails and £4 12s. 6d. for Blooms.

Old Rails.—These remain firm, there being a fair demand, while the supply is limited so far as Ts are

concerned, and nearly exhausted for D. Hs. We quote the former nominally $27.50.

Scrap.—Business is very dull. We quote nominally $28 for No. 1 ex ship, though there are rumors that Scrap has been offered for less.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Nov. 3.

Anthracite.

The coal trade remains quiet, and it is regarded as evidence of the satisfactory condition in which it is in general, that it has been able to maintain itself so steadily during the trying circumstances due to the warm weather of the past few weeks. On the whole, September prices are still the rule, and we hear less of exceptionally low figures than usual. Except a local advance on harbor and line prices at Philadelphia, the November circulars of the companies show no change. On the Philadelphia & Reading Railroad, tolls have been advanced ten cents, and are now on the basis of $2 per ton to Port Richmond. The Western Association has advanced grate and egg twenty cents,; stove and No. 4 ten cents ; and chestnut, thirty cents, an action which is strongly protested against in the West, dealers urging that it would tend rather to hurt than to strengthen the market.

Coal, in a recent issue, says :

The trade is considerably interested in the rumors, which as yet lack confirmation, that the Lehigh Valley Railroad Company is a party to the recent purchase of the control of the "Nickel Plate" road, the New York, St. Louis & Chicago Railroad. It is well known that the Lehigh Valley Railroad management has, since the death of Judge Packer, departed from the old line of policy, and has been seeking a wider field. It has in the past spent a very large amount in improvements at Buffalo and Chicago—being interested in the latter city in the East Chicago Improvement Company—all with the purpose of building up its Western anthracite trade.

The production of anthracite for the week ended October 28th was 701,108 tons, as compared with 693,889 tons the previous week, and 662,070 tons for the corresponding week of 1881. The total product from January 1st to October 28th was 23,760,141 tons, as against 22,968,699 tons for the like period of last year, showing an increase this year of 791,442 tons.

Bituminous.

Since our last, nothing has occurred to change the status of affairs. The Clearfield operators are still, to some extent, forced to take coal from the Cumberland companies to fill certain orders, as the schedule rates are prohibitory in some businesses. There is, besides, a scarcity of cars in the Clearfield region, which is hampering the operators, who have a right to ask that the settlement of pending matters be as speedy as possible.

The trade is quiet, and as the Clearfield operators are not purchasing now as much as they have been doing, transactions are limited, though prices are still tolerably firm.

For Cumberland, alongside, $4.75@$4.85 is quoted, while for Clearfield $4.85@$5 is nominally asked.

Freights from Baltimore to the East are higher, being $1.85@$1.90 to Boston.

STATISTICS OF COAL PRODUCTION.

The Production of Bituminous Coal for the week ended October 21st was as follows :

Tons of 2000 lbs., unless otherwise designated.

	Week. Tons.	Year. Tons.
Cumberland Region, Md.		
Tons of 2240 lbs	52,653	1,008,004
Barclay Region, Pa.		
Barclay RR., tons of 2240 lbs.	9,025	323,028
Broad Top Region, Pa.		
Huntingdon & Broad Top RR	5,539	228,489
East Broad Top	1,727	74,142
Clearfield Region, Pa.		
Snow Shoe	5,708	182,207
Tyrone and Clearfield	55,388	2,244,679
Alleghany Region, Pa.		
Pennsylvania RR.	10,193	434,6 2
Pittsburg Region, Pa.		
West Penn RR	8,216	278,559
Southwest Penn. RR.	3,005	84,290
Penn & Westmoreland gas-coal, Pa. RR.	26,462	1,016,748
Pennsylvania RR.	13,941	526,507
Total	191,857	6,401,425

Comparative statement of the production of anthracite coal for the week ended October 28th, and years from January 1st :

Tons of 2240 lbs.	1882. Week.	1882. Year.	1881. Week.	1881. Year.
Wyoming Region.				
D. & H. Canal Co.	89,895	2,898,548	78,733	2,937,714
D. L. & W. RR. Co.	103,251	3,743,977	97,589	3,495,487
Penna. Coal Co.	36,144	1,169,575	30,158	1,145,554
L. V. RR. Co.	24,037	896,923	17,943	936,479
P. & N. Y. RR. Co.	3,800	158,797	.....	80,207
C. RR. of N. J.	48,500	1,885,731	62,625	1,917,792
Penna. Canal Co.	14,308	422,593	15,815	388,470
	319,935	11,176,144	302,863	10,901,703
Lehigh Region.				
L. V. RR. Co.	120,947	3,960,350	106,650	3,673,198
C. RR. of N. J.	53,369	1,839,607	68,153	1,800,172
S. H. & W. B. RR.	.....	42,308	.....	10,426
	174,310	5,842,265	174,803	5,483,796
Schuylkill Region.				
P. & R. RR. Co.	175,238	5,648,006	159,763	5,683,072
Shamokin & Lykens Val.	29,875	1,043,436	24,641	848,895
	205,113	6,691,442	184,404	6,531,967
Sullivan Region.				
St Line & Sul. RR. Co.	1,750	50,290	.....	51,233
Total	701,108	23,760,141	662,070	22,968,699
Increase	39,038	791,442	.....	.....
Decrease	.....	.....	.....	.....

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent. of the whole production.

Total same time in 1877 ..... 14,626,835 tons.
" " " " 1878 ..... 13,817,359 "
" " " " 1879 ..... 21,585,647 "
" " " " 1880 ..... 19,069,128 "

The decrease in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 838,411 tons, as compared with the corresponding period in 1881.

Belvidere-Delaware Railroad Report for the week ended October 28th :

	Week.	Year. 1882.	Year. 1881.
Coal for shipment at Coal Port (Trenton)	3,185	80,460	62,589
Coal for shipment at South Amboy	17,343	691,455	605,063
Coal for distribution	15,826	606,646	582,834
Coal for company's use	2,225	107,035	93,624
Total	38,579	1,485,596	1,344,110
Increase	.....	141,486	.....
Decrease	.....	.....	.....

The Transportation of Coke over the Pennsylvania Railroad for the week ended October 21st, and year from Jan. 1st :

Tons of 2000 lbs.	Week.	Year.
Penn. RR. (Alleghany Region)	2,093	89,448
West Penn. RR	2,359	93,431
Southwest Penn. RR	30,889	1,411,016
Penn. & Westmoreland Region, Pa. RR	5,811	206,488
Pittsburg, Penn. RR	8,049	453,183
Snow Shoe (Clearfield Region)	358	17,236
Total	49,559	2,270,802

Horsford's Acid Phosphate

In Dyspepsia.

FRANCIS H. ATKINS, A. A. Surgeon, U. S. A., says: "For Dyspepsia, whether in the lean or corpulent, in nervous debility, and in night sweats of consumption, it has commonly given speedy benefit, and some of my army friends are quite enthusiastic about it."

SAN FRANCISCO, Oct. 28, 1882

THE BODIE CONSOLIDATED MINING COMPANY has declared

DIVIDEND NO. 12,

of TWENTY CENTS per share, payable November 15th. Eastern stockholders of record will be paid at the office of LAIDLAW & Co., 14 Wall Street, New York. Transfer-books will close Novembr 3d. WM. H. LENT, Secretary.

CANNEL AND BITUMINOUS COAL LANDS FOR SALE.—A tract of 566 acres of excellent quality on the Chesapeake & Ohio Railway and Kanawha River, near Charleston. Address

HON. C. HEDRICK,
Charleston, Kanawha County, West Virginia.

FREIGHTS.

Coastwise Freights.

Per ton of 2240 lbs.

Representing the latest actual charters to Oct. 30th, 1882.

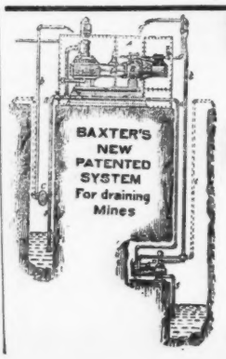
PORTS.	From Philadelphia.	From Baltimore.	From Elizabethport, Port Johnston, South Amboy, Hoboken, and Weehawken.
Alexandria	.70@80.	.75@.90	.....
Annapolis	.....	.....	.....
Albany	.....	.....	.50
Baltimore	.50§	.....	.....
Bangor	.....	2.00	.....
Bath, Me	1.40	1.75@1.85	1.20
Beverly	1.50	.....	1.20
Boston, Mass	1.40 @1.55	1.75@1.90	1.10@1.15
Bristol	1.30	1.70	.....
Bridgeport, Conn.	.....	1.60	.65@.70
Brooklyn	.85§	1.45	.22·2H. .35§
Cambridge, Mass.	1.50‡	2.00‡	.....
Cambridgeport	1.60‡	2.00‡	1.10@1.15
Charleston, S. C.	.75	.80@1.00	.....
Charlestown	1.50	1.90	1.15
Chelsea	1.50	1.90	1.15
City Point	.....	.90	.....
Com. Pt., Mass.	1.60	.....	1.10@1.15
E. Boston	1.45	1.90	1.10@1.15
East Cambridge	1.50‡	.....	.....
E.Gr'nwich, R. I.	1.30	.....	.....
Fall River	1.30	1.60	.95@1.00
Galveston	4.00	3.50	.....
Georgetown, D.C.	.70@.80	.80	.....
Gloucester	1.45@1.50	.....	.....
Hartford	.....	2.00	.....
Hackensack	.....	.....	.....
Hudson	1.00§	.....	.....
Lynn	1.60	2.25	1.25@1.30
Marblehead	1.60	.....	1.15@1.20
Medford	.....	.....	.....
Millville, N. J.	.....	.....	.....
Milton	.....	.....	.....
Newark, N. J.	.....	1.50@1.60	.....
New Bedford	1.30	1.60@1.65	.....
Newburyport	1.60	2.00@2.25	.....
New Haven	.....	1.60	.65@.70
New London	.....	1.60@1.75	.80
Newbern	.....	2.00	.....
Newport	1.30	.70	.95@1.00
New York	.85§	1.45	.....
Norfolk, Va	.80	.70@.80	.....
Norwich	.....	1.75@1.80	.80@.85
Norwalk, Conn	.....	1.60	.....
Pawtucket	.....	1.80	.....
Philadelphia	.....	.75	.....
Portland	1.40	1.75@1.85	.90*
Portsmouth, Va.	.80	.70	.....
Portsmouth, N.H.	1.60	1.80@2.10	1.25@1.30
Providence	1.30@1.25	1.60	.95@1.00
Quincy Point	.....	2.00	1.25
Richmond, Va.	.90	1.05	.....
Rockland, Me.	.....	2.00	1.15
Rockport	.....	2.00	.....
Roxbury, Mass.	1.50‡	2.00	.....
Saco	.....	2.25 to 2.30	.....
Sag Harbor	.....	.....	.90
Salem, Mass.	1.60	1.80@2.00	1.25@1.30
Saugus	.....	.....	.....
Savannah	.....	1.25	.....
Somerset	1.30	1.60	.95@1.00**
Staten Island	.....	.....	.....
Trenton	.....	.75	.....
Troy	1.00§	.....	.....
Wareham	.....	1.70@1.75	.....
Washington	.70@.80	.80@.90	.....
Weymouth	.....	2.00	.....
Williamsbg, N.Y.	.....	1.45	.....
Wilmington, Del.	.....	.75	.....
Wilmington, N.C.	.....	1.50	.....

* And discharging. † And discharging and towing. ‡3c. per bridge extra. § Alongside. ‖ And towing up and down. And towing. ** Below bridge. †† Towing and pilotage, $75. H Hoboken.

We are still short of tonnage, with firm market and orders abundant.

GEORGE W. JONES & Co.

BALTIMORE, Oct. 30.



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MANUFACTURERS OF

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